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THE WASTING DISEASES

OF

INFANTS AND CHILDREN

By the same Author,

A PRACTICAL TREATISE ON DISEASE IN CHILDREN. 8vo.

CLINICAL STUDIES OF DISEASE IN CHILDREN. Second Edition. Post 8vo.

ON

THE WASTING DISEASES

OF

INFANTS AND CHILDREN

BY

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HOSPITAL FOR DISEASES OF THE CHEST, VICTORIA PARK

FIFTH EDITION

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PREFACE TO THE FIFTH EDITION.

In preparing a fifth edition of this work for the press the text has been revised, and many alterations and additions have been introduced. Every care, however, has been taken to maintain the practical character of the book, so that it may continue to be a safe guide to the management of some of the commonest but not the least fatal of the maladies of early life.

George Street, Hanover Square,
December, 1887.

PREFACE TO THE THIRD EDITION.

In preparing for the press a third edition of the Wasting Diseases of Children, the Author has endeavoured to make the book more worthy of the favour with which it has been received by the profession in this and other countries.

The disease chronic tuberculosis, which in former issues was treated of in a separate chapter, has been restored,

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in the present edition, to its proper place as a part of chronic pulmonary phthisis. The two chapters relating to this important subject, together with the succeeding chapter on caseation of glands, have been almost entirely re-written.

Other large portions have also been re-written—notably, the method of hand-rearing of infants: the treatment of chronic vomiting, and of tape-worm: the pathology and morbid anatomy of rickets and of inherited syphilis. Besides these, however, considerable alterations have been made in all parts of the volume, and every page may be said to contain some addition or correction, which it is hoped will add to the practical usefulness of the book.

The diet tables in Chapter XI. have also been revised. These dietaries have been sometimes spoken of as "too elaborate." It is true they contain variety, but the meals themselves are composed of simple materials, and are readily prepared. Additional experience has only confirmed the Author in his opinion that at all ages variety in the meals is an important aid to nutrition. Hand-fed infants, in particular, are often as sensitive as older persons to monotony of diet; and frequent changes in their food tend greatly to sharpen appetite and encourage the powers of digestion.

George Street, Hanover Square,
October, 1878.

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Archd. C. Fairbairn.

ON

THE WASTING DISEASES

OF

INFANTS AND CHILDREN.

INTRODUCTION.

WASTING a sign of defective nutrition—Importance of detecting the cause of mal-nutrition—Wasting not always the first sign, and may even be absent in slight cases—Defective nutrition may be the result of acute disease—Liability of badly-nourished children to secondary acute diseases — Peculiarities of these secondary diseases—Insensibility of the nervous system in cachectic children —Infrequency of reflex convulsions—Importance of detecting the secondary diseases—Information to be derived from examining the face of the infant—M. Jadelot's lines -Colour of face—Breathing — Cry—Causes of large belly in infants — Infrequency of mesenteric disease—Mode of examining liver and spleen.

General Treatment of Wasting.—Uselessness of tonics so long as there remains any derangement of the stomach or bowels—Importance of minuteness in giving directions about diet. *External Applications.*—Frictions — Counter-irritants — Baths—Hot—Mustard—Cold. *Internal Remedies.*—Cod-liver oil must not be given in too large doses—Stimulants.

WASTING is a sign of defective nutrition: the waste of the body continues, but new material is introduced in quantity insufficient to supply the loss of tissue.

Wasting may be temporary or persistent. Every deviation from health will affect, to a certain extent, the nutrition of the body, and, according as the interference with nutrition is more or less complete, the wasting goes on with more or less rapidity. The interference is great in proportion to the acuteness of the cause which produces it. Any acute disorder, such as an inflammatory attack, or an attack of acute diarrhœa, will produce an immediate pause in the nutritive process he flesh at once begins to feel flabby and soft; and a continuance of the purging, if the drain be severe, causes a visible loss of flesh, which is as rapid as it is alarming. On the cessation of the acute attack, the flesh is recovered almost as rapidly as it was lost: a few days restore the child's ordinary appearance, and with his flesh his colour and spirits return. On the other hand, in chronic disorders, emaciation proceeds much more gradually; but nutrition, as it is slowly impaired, is also slow to be re-established. The present volume deals only with cases of slow impairment of nutrition, where the loss of flesh is gradual, and the wasting cannot be attributed, at any rate directly, to any acute febrile attack. In all such cases the cause should be carefully inquired for, as the defect in nutrition can only be effectually remedied by removing the cause which has produced it. This cause may be unsuitable food, the child being actually starving from his inability to digest and assimilate the diet with which he is supplied. He may be prevented from assimilating an ordinarily digestible diet by some unhealthy condition of his alimentary canal; or a constitutional defect, such as the existence of tuberculosis, or the poison of syphilis pervading the system, may interfere with the proper nutrition of the tissues.

It is extremely important to detect the earliest symptoms of defective nutrition. Wasting is not always one of the first signs, and may even be altogether absent if the interference with nutrition is not carried to a high degree. Thus, a child may be exceedingly plump, and may perhaps excite admiration by his good condition, although at the same time he be suffering from the insidious commencement of rickets, which, if the causes producing the disease continue unchecked, will shortly assert itself unmistakably. Acute disease is often a starting point for mal-nutrition, either by awakening a dormant diathetic tendency; or by leaving behind it a chronic derangement of the alimentary canal; or by impeding nutrition by some mysterious influence over nervous power. Thus measles not unfrequently excites the manifestations of a previously latent tubercular tendency; scarlatina and measles are apt to be followed by obstinate diarrhœa; and diphtheria is often succeeded by a loss of nervous power, usually indeed local, but sometimes general and sufficiently serious to interfere with the working of all the functions of the body.

In every acute disease there are, therefore, two dangers; the immediate danger and the remote danger. The first presses itself upon our notice, and cannot be overlooked; the second, obscured by distance, is apt to be disregarded. Acute disease always excites attention and receives immediate treatment, but it is not enough to rest satisfied with the cessation of pressing symptoms. There is always the danger that the defective nutrition, at first merely temporary, may become confirmed; in other words, that chronic disease may be established.

One consequence of the weakly condition to which badly nourished children are reduced is their liability to secondary acute diseases. In a child suffering from the results of chronic interference with nutrition, from whatever cause, the power of resisting new injurious influences is very much impaired. In such a state he is constantly found to be affected by causes so slight as to pass almost unnoticed, and which in a healthy child would be completely powerless to do harm. If the emaciation and debility of the child are very great, the secondary diseases may give very little evidence of their presence; for an infant reduced by mal-nutrition to a cachectic state loses many of the vital characteristics of early childhood, especially the intense excitability of the nervous system, which is so striking a peculiarity of healthy infancy. In a robust child we constantly find the whole system suffering violently from sympathetic derangement set up by some trifling disturbance. A lump of indigestible food, or a slight impression of cold, will not unfrequently produce burning fever, and alarming nervous symptoms, as delirium, convulsions, or even a state approaching to coma. On the other hand, in an infant much reduced by long-continued impairment of nutrition, the most serious diseases may give no signs of their presence. Pneumonia may exist with little fever and no cough, and a serious intestinal lesion without pain and with only trifling diarrhœa.

A good example of the insensibility of the nervous system to local impressions is seen by attempting the well-known experiment of gently stimulating the genito-crural nerve. In a healthy child the finger-nail drawn lightly along the upper two-thirds of the inner aspect of the thigh produces an instantaneous rise of the testicle of that side, by the action of the cremaster muscle which draws it up close to the external abdominal ring. In a cachectic child the same experiment is followed by no result whatever; the cremaster does not contract, and the testicle remains motionless. In such cases, therefore, there is absence of the normal excitability of the nervous system so characteristic of healthy infancy. This insensibility of the parts of the nervous system concerned in the production of reflex movements is further indicated by the infrequency of reflex convulsions in such children. In well-nourished children these are exceedingly common, and the natural nervous sensibility appears to be heightened by anything which causes a *sudden* weakening of the system, as severe acute diarrhœa, or great loss of blood. When, however, the debility is produced more slowly, the same result does not follow, and the excitability of the nervous system, instead of being exalted, is more or less completely destroyed.

For this reason, acute diseases, attacking a child whose nutrition is thus seriously impaired, have very special features. They are distinguished by an absence of those peculiarities which we are accustomed to consider inseparable from the disorders of childhood, and resemble more the same diseases as they occur in advanced age. They begin more insidiously; run their course more slowly; give rise to fewer symptoms; and often end suddenly and unexpectedly in death. Although thus undemonstrative, they are not, however, on that account less dangerous; indeed, the prognosis may be said to be serious in proportion to the fewness of the symptoms by which their existence is announced. By offering an additional obstacle to nutrition they still further weaken the already enfeebled constitution, and the disease, if it does not prove immediately fatal, is apt to hang on, gradually reducing the child more and more, until he sinks under its effects.

It is difficult to over-estimate the importance of an early diagnosis of these secondary disorders. On account of their insidious beginning they are frequently overlooked, and it is often only by the more rapid debility they induce that suspicions of their existence are at last excited. As the infant is unable to communicate his ideas by speech, the eye should be practised to gather from the expression and gestures of the child the information which he can give in no other way. A careful perusal of the face is therefore of the utmost importance. By it we can ascertain the existence of pain, and can often distinguish the part of the body which is the seat of serious disease. Thus, pain in the head is indicated by contraction of the brows; in the chest, by a sharpness of the nostrils; and in the belly, by a drawing of the upper lip.

M. Jadelot, a former physician to] the Hôpital des Enfans Trouvés at Paris, was the first to draw attention to certain lines or furrows, which become marked on the face of a child suffering from serious disease, and the situation of which furnishes indications as to the part of the body to which it is necessary to direct our examination.

The *oculo-zygomatic* line, or furrow, begins at the inner angle of the eye, and passing outward underneath the lower lid, is lost a little below the projection formed by the cheek-bone. This points to disorder of the cerebro-nervous system, becoming strongly marked in all those diseases whose primary seat is the brain or nerves, or in cases where those organs become affected secondarily to disease which has begun in other parts.

The *nasal* line rises at the upper part of the ala of the nose, and, passing downwards, forms a rough semicircle round the corner of the mouth. Joining this at an angle about its middle is another line, called *genal*, which reaches from that point almost to the malar bone, and in certain faces forms the dimple of the cheek. These indicate diseases of the digestive passages and the abdominal viscera.

The *labial* line begins at the angle of the mouth, and is directed outwards, to be lost in the lower part of the face. It is seldom so deep as the preceding. It is a sign of disease of the lungs and air passages.

M. Jadelot attributed immense importance to these lines, and even stated that he had been enabled to discover the exact period at which the cough of pertussis assumed its convulsive character by the appearance of the oculo-zygomatic line upon the child's face. Without, however, attaching to them the same significance which they assumed in the opinion of their discoverer, there is no doubt that they often furnish important indications, and are, therefore, points to which attention should always be directed in the examination of a young child.

The colour of the face should be carefully noted. Lividity of the lips and of the eyelids, if extreme, is a sign of imperfect aëration of the blood; but a faint purple tint of the eyelids and round the mouth usually indicates nothing more than weak circulation, or a slight difficulty of digestion. A peculiar waxy-yellow tint is seen in certain parts of the face in inherited syphilis; and there is an earthy tinge of the face and whole body in many cases of chronic bowel complaint. Exhaustion is indicated by coolness and pallor of the face, by marked lividity of the eyelids and mouth, and, in extreme cases, by a half-closure of the eyes, so as to leave the lower part of the whites exposed, while at the same time the fontanelle is deeply depressed. The state of the fontanelle should be always examined, for it forms a very important guide to treatment: if much depressed, stimulants should never be withheld.

The breathing must be watched. If rapid and accompanied by movement of the nares, there is usually bronchitis or pneumonia, and a careful examination of the chest should always be made. Unequal movement of the two sides of the chest in respiration generally indicates a serious lesion on the side at which the movement is least. If the respiratory action of the abdominal muscles be increased, attention is at once directed to the chest. If the belly be motionless, it is often the seat of an inflammatory complication.

The cry of the infant varies very much in character. In cerebral affections it is sharp, short, and sudden. In lesions of the abdomen, exciting pain, it is prolonged. In inherited syphilis, it is high-pitched and hoarse. In inflammatory diseases of the larynx, it is hoarse, and may be whispering. In inflammatory diseases of the lungs, and in severe rickets, the child is usually quiet, and unwilling to cry on account of the action interfering with the respiratory functions.

The infant should always be completely stripped for examination. We can then at once observe the form and play of the chest, the state of the abdomen, the condition of the skin, whether hot or cool, dry or moist, and the conformation of his limbs. Besides, any eruption upon the skin is at once detected by this means.

The large size of the belly in weakly children often attracts the attention of parents, and excites much anxiety. It is most commonly produced by accumulation of flatus, owing to the weakness of the muscular walls. It may be also due to displacement of the abdominal contents, such as occurs so often in rickets on account of the depression of the diaphragm forcing the viscera downwards from beneath the cover of the ribs. The liver and spleen may be enlarged; and great masses of sarcoma occasionally spring from the kidney and other abdominal organs. Ascites may be present from tubercular or simple peritonitis, from Bright's disease, or, rarely, from disease of the liver. Tubercular peritonitis may also produce extreme tympanites. Accumulations of fæcal matter sometimes take place, and great enlargement of the mesenteric glands may occur, but these causes are rarely sufficient in themselves to produce any remarkable swelling. If abdominal distension be noticed in such cases, the enlargement is due almost invariably to gaseous accumulation owing to fermentation of food.

It must be borne in mind that great distension of the belly in an infant—distension so great as to excite the anxiety of the friends—is by no means necessarily a sign of illness. Careful mothers will often seek medical advice on account of swelling of the abdomen in their infants. If in such a case nothing abnormal, except the size, is to be observed, we may confidently assure the parent that there is nothing to fear.

Even if the distension is considerable and is associated with wasting, the evident interference with nutrition is not to be taken as a sign that the abdominal enlargement is due to serious disease. Great accumulation of gas in the alimentary canal is the consequence of fermentation of food excited by digestive derangement; gastric troubles necessarily hinder the introduction of nutritive material into the system, and in early life loss of flesh quickly follows any check to the processes of nutrition. Still, it is not uncommon to hear the symptoms attributed to "mesenteric disease," and great alarm is sometimes excited in the minds of the parents by unfounded apprehensions as to the condition of the abdominal glands. It is well, therefore, to bear in mind that distension of the abdomen and wasting may be present together in a child as a consequence of mere disorder of function; that caseation of the mesenteric glands is not common under the age of three years; and that, in any case, if an examination of the belly detects no obvious enlargement of these glands, we are not justified in referring the symptoms to any form of glandular degeneration.

In examining the abdomen the size of the liver and spleen should always be investigated. These organs lie just below the surface, and their lower borders, if projecting below the ribs, can be readily felt by placing the palm of the hand flat upon the belly and palpating with the tips of the fingers. It is not enough, however, to ascertain merely the inferior limits of these viscera. Both the liver and spleen may be enlarged although their lower borders project little, if at all, beyond the margin of the ribs. On the other hand, their inferior margins may be felt some distance below the edge of the ribs, from displacement downwards of the organs, although there is no actual increase in size. Therefore, having fixed the level of the lower border, we should, in the case of each, proceed to determine the upper limit by percussion. In this way we may find that the liver extends upwards to the third rib, and that the splenic dulness can be traced as far as the angle of the scapula.

In the *treatment* of chronic wasting in a young child our first care should be to remove any derangement of the stomach and bowels. For this object a strict regulation of his diet is indispensable. In the great majority of such cases the cause can be distinctly traced to improper feeding, and therefore an alteration in the diet is the first step to a cure. Tonics given to a child whose bowels remain disordered are of little service, for, so long as the derangement of the alimentary canal continues, nutrition cannot be restored on account of the impediment thus presented to the digestion and assimilation of food.

Directions on the subject of diet cannot be too precise; it is necessary to state distinctly not only the articles of food to be given, but the quantities to be allowed at each meal, and the frequency with which the meals are to be repeated. It is advisable to write down all such directions, that misunderstanding may be avoided; in fact, the same attention should be paid to this subject as is paid to the ordering of drugs.

After the diet has been altered to suit the requirements of the case, more special treatment is called for, and the means at our command may be divided into two classes, viz., external applications, and internal remedies.

External applications are of great service in all chronic diseases, for it is important to restore as quickly as possible the healthy action of the skin. For this purpose, frictions, counter-irritants, and baths, hot or cold, may be used.

Frictions can be employed with the hand alone, with stimulating liniments, or with cod-liver oil. By this means the circulation is rendered more vigorous, and the action of the skin is promoted. The feebleness of the circulation in most cases of chronic disease in the infant is shown by the coldness of the extremities. When these have been warmed by suitable applications, the beneficial influence is often very decided; pain in the belly ceases, and the child usually falls into a quiet sleep. Friction with stimulating liniments is merely a mild form of counter-irritation which can be applied generally, and has a more powerful influence in stimulating the circulation and promoting a flow of blood to the surface, than friction with the hand alone. It is useful in all cases where the debility is great.

But it is not only the skin which is influenced by such manipulations. The subject of manual therapeutics has lately received fresh attention, and the impetus which can be given to healthy tissue change by a skilful kneading and working of the muscles and subcutaneous structures has been taken advantage of in the treatment of various forms of chronic disease. Amongst others: in long standing cases of chorea great benefit may be derived from energetic massage of muscle and manipulation of joints, so as to excite active muscular waste, while at the same time the increased tissue wants are satisfied by a copious dietary: in rickety children, whose backs are especially limp and powerless, very evident increase of strength quickly follows regular and vigorous shampooing; and in obstinate costiveness important results can be obtained by systematic kneading of the abdomen combined with suitable frictions.

Rubbing with cod-liver oil is useful in weakly children, especially if the weakness is associated with irritability of stomach and poor digestion. By this means a considerable amount of nourishment may be introduced into the system. But oily frictions, or the mere application of oil to the surface of the body, have another object besides that of supplying nourishment. When the oil, slightly warmed, is smeared over the body with a piece of fine sponge, and the child, wrapped in flannel, is afterwards placed in his bed or cot, one of the first effects noticed is a profuse general perspiration. This is accompanied sometimes by a little erythematous eruption, which resembles the rash of measles. At the same time, any irritability of the nervous system is quieted, and the child soon falls into a tranquil sleep. A third effect is an increase in the quantity of all the secretions: the urine is more abundant, and the functions of the liver appear to be rendered more active, for, according to the observations of Bauer, of Tubingen, the stools, from being green and sour-smelling, become yellow and natural.

To produce these effects, it is not essential that cod-liver oil be employed. Other oils will be found equally efficacious, and are, indeed, generally to be preferred, on account of the disagreeable smell of the fish oil, which is often a source of discomfort. Through its influence in promoting the action of the skin, anointing with oil is of great service in all the diseases which are here treated of, and in cases where the weakness and emaciation are extreme, striking results sometimes follow the application, if it be repeated with sufficient perseverance. A warm bath, or a thorough sponging of the whole body with very warm water, immediately before the oil is applied, is useful in preparing the skin for the action of the oil, and adds greatly to its efficiency.

In the application of counter-irritants to young children great care must be taken not to carry the counter-irritation too far. An irritant which, in a healthy child, would produce only a moderate degree of redness, will often, where the strength is much reduced, set up very great inflammation, or even produce sloughing of the tissues. Such a result would not only still further reduce the child's little remaining strength, but would act as a direct irritant to the part for which it is intended to be a derivative. For this reason counter-irritation should, as a rule, be general rather than local, being employed in the form of stimulating liniments and hot baths. Sometimes, however, a local counter-irritant is required. In these cases equal parts of flour of mustard and linseed meal should be used. Blisters are inadmissible for infants.

For the hot bath, the water should be of the temperature of from 95° to 100° Fahr., and should be sufficient in quantity to cover the child up to the neck. After remaining in the water for three, four, or five minutes, he should be quickly but thoroughly dried, and be then wrapped in flannel and returned to his cot. It is of great importance that he should not be left too long in the hot water. The effect of the hot bath is at first stimulating, but after stimulation comes reaction, and depression is induced. He must be, therefore, removed before the stimulating effect has had time to pass off. Children, especially when unwell, often show great repugnance to the bath, and become much terrified at the sight of the water. In these cases it is convenient to cover the bath with a blanket; the child, being placed upon this, can be lowered gently down into the water without seeing anything to excite his apprehensions.

Sometimes a more powerful stimulant is required. In these cases the child should be wrapped in flannel wrung out of hot water, and upon which some flour of mustard has been sprinkled; the whole being covered with a dry warm blanket. Or the mustard bath may be adopted. For this, some flour of mustard is mixed with cold water, and is put into a linen bag. The bag is then squeezed in the bath, and the water becomes strongly sinapised. The child is held in the warm water until the arms of the persons supporting him begin to prick and tingle. The quantity of mustard required for this bath is in the proportion of two ounces to five gallons of water.

The immediate effect of the *cold* bath is directly contrary to that of the hot bath. Its first effect is depressing, on account of the shock. In a few seconds, however, reaction succeeds to the temporary depression, the surface of the body glows, and the pulse becomes fuller and stronger. It acts, therefore, as a general stimulant and tonic, promoting nutrition, and giving tone to the body. If continued too long, reaction subsides, and there is a sense of chilliness and languor, with loss of appetite, which may last for several hours. The shock is great in proportion to the coldness of the water, and the degree of weakness of the patient. The addition of salt to the water makes it more stimulating, and increases the vigour of the reaction.

On account of these effects the cold bath should be used with caution, and is inadmissible until the child is far advanced towards convalescence. It then becomes a valuable means of invigorating the system. The water should not at any time be below the temperature of 60° Fahr., and should be used tepid at the first, the temperature of succeeding baths being gradually reduced as the child gets stronger. Any chilliness or languor after the bath are signs that too cold water has been used, or that the bath has been continued too long. To be beneficial the whole process should be rapid. The child should be quickly sponged, and should then be dried briskly with a thick soft towel. The whole body should be afterwards well and firmly rubbed with the open hand to assist the reaction. In the case of delicate children, when a cold bath is used, it is advisable to prepare the skin for the action of the cold water by a vigorous shampooing of the spine and the body generally. By this means the skin is stimulated to resist the shock, and reaction is promoted. The shock is also diminished by allowing the child to sit with his feet and a few inches of his body in hot water (100°) while a pitcher of water at a temperature of 65° Fahr. is rapidly emptied over his shoulders. By the use of such precautions weakly children may make use of the cold bath without discomfort, and with the greatest benefit to their health.

Of *internal remedies* little need be said in this place, as full directions will be given afterwards in considering the treatment of the various diseases. The important point to remember is the uselessness of tonics so long as any derangement of the digestive organs remains uncorrected. In order that tonics may be beneficial, the stomach and bowels must be in a healthy state. It is only when digestion is restored that these remedies are admissible. They will then prove of extreme service, increasing the vigour of the stomach, and improving the tone of the whole body.

To the general list of tonics cod-liver oil is an important addition. It is, indeed, more a food than a medicine; but for this very reason it should not be given in too large quantities. If too large a dose of the oil is given, only a portion becomes digested. The remainder passes down through the bowels, and is seen unchanged in the stools, where it is at once recognized by its appearance and smell. In administering the oil our object should be to give as much as can be readily digested, but no more. For a child under two years of age ten drops will be a sufficient dose at the first. The quantity, after the first few days, can be gradually increased, but a careful watch must be kept upon the stools, and the appearance of any oil unchanged in the evacuations is a sign that the quantity must be reduced. For a child of this age we can seldom go beyond twenty drops for the dose, three times in the day. It must always be remembered that the oil is an addition to, not a substitute for, other food, and is therefore only useful so long as it is well borne by the stomach. If it be found to impair the appetite, or to interfere in the slightest degree with digestion, its use should be immediately discontinued.

With regard to stimulants: they are always required when the fontanelle becomes much depressed. The best form for infants is pale brandy, of which a few drops (five to ten) may be given in cold water or a little milk, as often as circumstances seem to demand the repetition. For older children the brandy-and-egg mixture of the pharmacopœia makes the best stimulant.

CHAPTER I.

INFANTILE ATROPHY.

INFANTILE ATROPHY FROM INSUFFICIENT NOURISHMENT.—A very common condition—Causes—Insufficient supply of food—Varieties of breast milk—Test of a good nurse—Unsuitable food—Dependence of nutrition upon power of digestion — Over-feeding — Varieties of food required for perfect nutrition—Differences between woman's and cow's milk—Cow's milk cannot always be digested.

Symptoms.—Two classes, according to cause—Food suitable but insufficient—Food unsuitable—Wasting—Constipation — Cause of inactivity of bowels — Flatulence — Colic — Ravenous appetite — Eruptions on skin, strophulus and urticaria—Thrush, its importance in prognosis—Inward fits—Attacks of vomiting and diarrhœa —Convulsions—Aphthæ—Danger of secondary diseases—Mode of death.

Treatment.—Suckling—By mother—By nurse—Rules for choosing nurse—Directions for efficient suckling—Advantages of putting child early to breast after birth—Times of suckling—Artificial feeding—Directions—Feeding bottle—Importance of cleanliness—Infants' food—Malted foods—Cow's milk may disagree—Peptonised milk—Weaning—Usual time—Must sometimes be anticipated—Method of weaning—Reason why a child may refuse the breast—Diet after weaning—General management of infants—Treatment of—Constipation—Flatulence and colic—Convulsions —Thrush—Aphthæ—Diarrhœa and vomiting.

INFANTILE atrophy, or simple wasting from insufficient nourishment, is one of the commonest causes of death in infants under twelve months old. Many thousand children die yearly in London alone for the simple reason that they are fed with food which they cannot digest. And it is not only amongst the children of the poor that this form of marasmus is to be found. Infantile atrophy is common in all classes of life, for it is to faulty feeding, as a rule, rarely to actual want of food, that the wasting is to be ascribed.

It may happen, however, that there is a real deficiency in the food supply. If an infant depend solely upon the breast of a mother whose milk, although abundant, is poor and watery; or if suckling be protracted to a period when more substantial food is required, the nutrition of the child in either case must be unsatisfactory.

When the mother is weak, anæmic, and evidently ill-nourished, her milk no doubt always suffers from the impoverished state of her blood; but the converse of this is not always the case, for the milk of a woman may still be of very inferior quality, although in her health and general appearance she present no sign of weakness. MM. Vernois and Becquerel have shown that it is not women of the greatest muscular development who yield the richest milk; but that, on the contrary, a robust figure is inferior in milk-producing power to one slighter and less apparently vigorous.*

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* The proportion of casein normally existing in human milk has been the subject of some discussion. Up to recent times the analyses made by MM. Vernois and Becquerel, which estimated the proportion of casein at nearly 4 per cent. (3·924), and that of sugar at nearly 4½ per cent. (4·364), have been accepted without question as correct. But more recent investigations seem to show that these estimates were unduly low in the case of the sugar and unduly high in the case of the curd. According to MM. Henri and Chevalier the proportion of the several constituents in an average sample of human milk is as follows:—

Water	Casein	Sugar	Fat	Salts
87·95	1·52	6·50	3·55	·45

and the analyses of Dr. A. V. Meigs and others give very similar results.

Still, as regards its influence upon the preparation of cow's milk for an infant's diet this difference in the estimated proportion of casein is of small importance. As will be explained hereafter, it is not so much

For practical purposes, we may make a guess at the quantity and quality of the milk by inspection of the breasts of the mother or nurse. They should be pear-shaped, hardish, and mottled with blue veins. On pressure of the gland the milk should squirt out. The milk itself should be opaque and of a dull white colour. Under the microscope it should present fat globules of medium size, not too small. As a rule, the number of fat globules is a rough indication of the quantity of casein and sugar, although this, as has been said, is not always a trustworthy guide. The best test, however, of the goodness of the milk is derived from observation of the child. He should be watched while at the breast, and if he sucks vigorously, finishes the meal with the milk running over his lips, and requires to suck but a few times in the day, we may infer that the milk is sufficiently abundant. If, on the other hand, he constantly requires the breast, sucks laboriously and with effort, occasionally desisting and crying peevishly, the milk is probably scanty. As an additional test, the infant may be weighed immediately before and after taking the breast: the increase in weight should be from three to six ounces, according to his age.

Even if the mother's milk be poor or scanty, it is rare for infantile atrophy to arise from any failure in the quantity of food supplied, as there is seldom any lack of readiness to make good the deficiencies of the breast. As a rule, it is not the quantity but the quality of the food which is at fault, for the inflow of nutritive material may still fall greatly short of the infant's wants, although the supply of food, as food, is liberal enough. We see this in cases where a child is brought up by hand, either

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the excess of casein in cow's milk which constitutes the difficulty in artificial feeding, as the density of the clot formed by this casein when coagulated; and this compactness of clot is the same whether the milk be diluted with water or not. (See p. 22.)

wholly or partially, and fed with a food which his limited digestive power is unable to convert into material necessary for the growth and development of the tissues. Here the diet substituted for the mother's milk, although nutritious enough in itself, supplies little nutriment to the infant. A child is not nourished in proportion to the bulk of the food he receives into his stomach. He is only nourished by the food he can digest. Weakness in a child otherwise healthy, while it shows a deficient degree of nutrition, and therefore calls for an increased supply of nourishment, calls at the same time for increased care in the selection of the *kind* of food. There is a difference between food and nourishment. A child may take large quantities of food into his stomach, but from weakness of his digestive organs, or from the indigestible nature of the food swallowed, may derive no nourishment from it whatever. On the contrary, it may cause great irritation and pain in the alimentary canal, and, setting up a febrile state, still further reduce the child whom it was intended to support. The tendency of mothers is to overfeed their children—to mistake every cry for the cry of hunger. Consequently, as the peevishness and irritability of the child increase in proportion to the pain excited in the bowels, the food is made more and more "nourishing;" the louder the cry the thicker the "sop;" until at last a violent attack of vomiting or of diarrhœa takes place, or a convulsive fit warns the parent that it is time to desist. Cases of steady emaciation will be constantly found due to this cause, especially in children who are brought up by hand. Amongst the poorer classes they are commonly fed upon farinaceous food as soon as they are born. This, of course, they are totally unable to digest. As a consequence, they dwindle and rapidly die, or if of particularly robust constitution, linger on, weak, ailing, and rickety, until an attack of bowel complaint, or other intercurrent disease, carries them off. The very fact that the secretion of saliva in the young child does not become established until the third month after birth, seems to indicate that before that age farinaceous articles of diet are unsuited to the infant, as saliva is one of the most important agents in the digestion of starchy foods. Besides, for perfect nutrition four classes of food are required—viz., albuminates, fatty substances, carbo-hydrates, and salts. These are found in the most digestible form and the most perfect proportions for the young child in the casein, fat, sugar, and salts of the human milk. The casein supplies the waste of the nitrogenous tissues, as the muscles, and probably the brain and nerves, and by its oxidation, when it has formed part of these tissues, contributes also to animal heat. The fat is essential to the formation of muscular and nervous tissues, and also aids by its oxidation in the production of heat. The sugar is probably entirely heat-giving. The salts form the necessary constituents of all tissues.

In nutrition, it is important that tissue change should be rapid, and in young children, in whom development as well as growth is so brisk, this is of special importance. It is effected by the oxidation of old material, which is then removed, to be replaced by new matter. For rapid change, therefore, it is indispensable that no needless impediment should exist to the free oxidation of the tissues. Now, starches, and sugars into which the starches are converted by digestion, have a greater affinity for oxygen than albuminates; they, therefore, tend to appropriate the oxygen which is required for the removal of waste matters, and so to prevent the proper changes from taking place. For this reason alone, and without any reference to their indigestible properties, they form a very unsuitable diet for a young child.

Even those children who are fed entirely on cow's milk are not free from danger. By referring to the table * we

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* Dr. A. V. Meigs, Archives of Pædiatrics, April, 1884.

see, in comparing the milk of the cow with human milk, that the former contains a considerably larger quantity of casein. On the other hand, the proportion of sugar and cream is less than that found in human milk. In adapting it, therefore, as a substitute for the natural food of the child, it will be necessary to remedy these differences by dilution with water, and by the addition of a small quantity of sugar of milk. But this is not enough. There is another distinction between the two fluids which it is extremely important to take into consideration. On the addition of rennet, the casein of human milk coagulates into light, loose clots, formed by the aggregation of little flocculi, while that of cow's milk congeals into heavy, compact lumps. The same thing takes place in the stomach of the child, as is shown by producing vomiting in an infant directly after a meal by friction over the belly: the light, loose clots formed from human milk are then readily distinguishable from the dense masses of casein produced by coagulation of the milk of the cow. The difference in the digestibility of these two products is very evident. While the one is readily assimilated without any undue demand upon the digestive powers, the other tasks these powers to the utmost, and, unless a very moderate quantity has been taken, will undergo fermentation, and give rise to much flatulence, colic, and perhaps diarrhœa in its progress along the alimentary canal.

	WATER.	SUGAR.	CASEIN.	FAT.	ASH.
Woman's milk	87·163	7·407	1·046	4·283	·101
Cow's milk......	88·549	4·898	2·792	3·310	·451

Children are, no doubt, frequently found to thrive upon this diet, their digestive power being equal to the demands made upon it. Others, however, and by far the larger proportion, are not equal to this daily call upon their powers. They cannot assimilate this mass of curd. Consequently, unless rejected by vomiting, the meal passes through them undigested; their wants are not supplied; and they starve for lack of nourishment, although swallowing every day a quantity of milk which would be ample support to a stronger and healthier infant. Such children are exceedingly restless and irritable. They cry day and night; at one time from abdominal pains excited by the presence in the bowels of this undigested mass; at others from the hunger which the passage of this meal has failed to appease. The nurses say, very truly, that the "child is ravenous," and that "the milk does not satisfy him;" but the baked flour, the infant's biscuits, and "the tops and bottoms" by which they propose to themselves to attain that end are by no means calculated to do so. Instead of mitigating his distress, they aggravate it; and every additional meal, although it may quiet him for the time, by the discomfort which it is certain to produce forms a subject for future complaints. It is, however, often very difficult to persuade mothers and nurses of the importance of what has been stated. They see that the child is wasting under the diet they have first adopted, and therefore insist that something more solid must be required. It is necessary to impress upon them very strongly that a child may actually starve on the fullest diet; and that the presence of large quantities of farinaceous or caseous matters in the alimentary canal is not necessarily followed by any additional supply of nourishment to the tissues. In all cases where the food of an infant is said by nurses to be insufficient the stools should be carefully examined, and if, as is so frequently the case, they are found to consist of pale, round, hard lumps, exhibiting in their interior the cheesy appearance so characteristic of a mass of curd, we may safely conclude that it is not too little that is being given, but too much; and by taking the necessary precautions we may succeed in providing the child with a diet he is capable of digesting.

Besides the weakness produced by the withholding of nourishment, there is an additional cause of debility in the constant attacks of vomiting and diarrhœa, to which this indigestible diet invariably leads. Each of these attacks reduces him more and more, and by weakening his digestive powers renders him less than ever able to obtain any nourishment from the food with which he is supplied.

Symptoms.—The symptoms of simple wasting from insufficient nourishment may be divided into two classes, according to the nature and quality of the food taken:—

Food suitable, but insufficient.

Food unsuitable.

In the first of these classes there are no very striking symptoms. The infant gradually loses his plumpness; his fat slowly disappears; and the muscles get very flaccid and soft. He does not seem to grow. His face becomes pale, and his lips pale and thin. He is peevish as a consequence of his hunger; takes the breast ravenously at the first, and then, if the secretion of milk is scanty, desists at intervals to cry passionately as if in vexation at his inability to obtain the means of satisfying his wants. His skin is moist, and he perspires readily and copiously. The fontanelle is level or slightly depressed. At night he is exceedingly irritable and sleepless. In the daytime he will often lie quietly enough, holding both thumbs in his mouth, and sucking at them until the skin at the sides of the nail becomes raw and abraded. If the milk is poor but abundant, the child is usually very quiet and drowsy, passing almost all his time asleep. He may even sleep while at the breast—a sure sign that the milk is thin and serous. The bowels are usually confined, and the motions rather solid, although otherwise natural. No symptoms are found to indicate disease of any particular part of the body.

In this class of cases nutrition is defective on account of the inferior quality and insufficient quantity of the mother's milk, and nothing is added to compensate for these defects. The remedy is, of course, to supply the deficiency. When the required nourishment is given, the wasting stops at once, the peevishness ceases, and the child, rapidly regaining flesh, becomes strong and healthy.

In the second class of cases, where the food is bad in quality, we find the symptoms produced by the irritation of the digestive organs to which the presence of indigestible food necessarily gives rise. The child is dull and languid, his flesh becomes flabby, and he begins to waste. The skin is moist at the first, although afterwards it is apt to become dry, except about the head; and the fontanelle is, or soon becomes, depressed. The face and body generally are pale, and the complexion sometimes turns yellowish, assuming a half-jaundiced tint, which remains several hours, or even days, and then disappears. The tongue is clean, pink, and moist, and remains so as long as there are no symptoms of acute digestive disturbance. The bowels are irregular and capricious; constipation alternating with occasional attack of diarrhœa. The common condition is constipation; a stool occurring every second day, consisting of hard, whitish lumps, covered with a stringy mucus, and formed almost entirely of undigested food. Its evacuation is often attended with much straining, and may be preceded by some pain in the belly. The cause of this sluggishness of the bowels is the presence of mucus secreted in unusual quantities on account of the irritation to which the membrane lining the alimentary canal is exposed. This mucus, being coagulated by the acid resulting from the decomposition of the starchy food, covers the contents of the bowels, and also forms a tenacious lining round the inner surface of the intestine. Consequently the bowels, in their peristaltic action, glide over the slippery surface of the masses of food, and lose their power of propelling these forwards towards the outlet. Sometimes, however, instead of being confined, the bowels are open three or four times a day, the stools being green, half-liquid, slimy, and extremely offensive. In either case the food which the child has taken passes through him without being digested.

Flatulence is a source of great annoyance to the infant. It may cause paroxysms of violent pain, in which the face becomes white, the upper lip livid and everted, and the belly tense. The child utters piercing cries, at the same time drawing up the lower limbs suddenly and violently upon the abdomen. Even during sleep frequent startings and moanings, elevation of the corners of the mouth, and, if the pain be severe, a contraction of the brows, show that the child is suffering from abdominal pains. The smile which is sometimes seen upon the child's face during sleep is a result of the same cause, although, of course, to a much less degree. The wind is often evacuated in large quantities, or comes up as sour-smelling eructations, affording great relief. During the attacks of colic the action of the kidneys seems to be suspended, and the termination of the spasm is generally accompanied by a copious discharge of urine. The temper is exceedingly irritable. The pain and uneasiness from which these children suffer, and which is constantly being renewed by every additional meal, makes them noisy in their lamentations to a degree which is almost unbearable. As the mothers say, "they wear one's life out." At night this is especially the case. At that time they are apt to be feverish, and are often seized with fits of screaming which nothing will appease, and which sometimes continue until actual exhaustion compels them to desist. Even then, however, the cries are renewed at intervals, as a fresh attack of abdominal pain rouses them from uneasy sleep. At these times the feet are usually cold, although the belly, hands, and cheeks may be dry and hot.

But in spite of all this, or rather as a consequence of it, the appetite is usually enormous. The uneasiness produced by acidity and flatulence will often excite in children a great desire for food; and unless the uneasiness amount to actual pain, they will swallow ravenously whatever is offered to them. The amount of farinaceous matter an infant will consume in this way is sometimes very large; and the fact that, in spite of such voracity, the child should still continue to waste, excites much wonder amongst his attendants.

Attacks of nettlerash and strophulus, either separately or combined, are very common. With the appearance of nettlerash every one is familiar. Strophulus may be either of the red or the white variety.

Red strophulus (red-gum) begins as a red blotch, the centre of which is slightly elevated. The redness soon fades, and the central elevation enlarges and forms a flattened papule, often of considerable size. These are seated on the face, neck, arms, and sometimes cover the whole body.

White strophulus appears in the form of pearly white opaque papules, smaller than the preceding, and about the size of a small pin's head. They are seen usually on the face and arms.

The presence of either of these eruptions (nettlerash or strophulus) on the body of a young child is a certain sign of digestive derangement.

Thrush (parasitic stomatitis) is another consequence of the unsuitable diet to which the child is exposed, and is especially common in warm weather. The mucous membrane of the mouth becomes red; then little concretions, transparent at first, afterwards pearly white, appear on the reddened surface, unite, and form patches varying in size, and looking like little bits of curd adhering to the tongue, and to the inside of the cheeks and lips. In very bad cases they line the whole interior of the mouth, and may extend into the fauces, down the gullet, and even, according to Parrot, into the stomach and intestines. At the same time there is a little febrile disturbance, with some thirst; usually vomiting; and often a thin watery diarrhœa, from the irritation of deranged intestinal secretions. If, as frequently happens, the nates become red and excoriated by the discharges from the bowels, the thrush is said by nurses to have "gone through" the child. There is some tenderness of the mouth, and if the child be put to the breast in the course of this complaint, he often refuses to suck on account of the pain excited by the movement of the tongue and cheeks.

The concretions are due to a cryptogamic vegetation (oidium albicans), the sporules of which increase with great rapidity, and form tubular fibrils. These, with an increased formation of epithelial scales, constitute the white patches seen on the mucous membrane. The plant finds a nidus in the altered secretions of the mouth.

This is either a mild or a severe complication, according to the general condition of the child in whom it is found. If it occur in a child who has been reduced to a state of great weakness by a long course of improper food, it is of very unfavourable augury, for in such a case our hopes of improving his health depend upon the rapidity and completeness with which new material for nutrition can be introduced into the system. Anything, therefore, which tends to prevent the introduction of nourishment tends to deprive the child of this his only means of recovery; and the presence of thrush betrays a condition of the digestive passages extremely unfavourable to the ready assimilation of food. Moreover, the diarrhœa which is so apt to accompany the disorder, especially in weakly children, is another reason for regarding the occurrence of this complication, in such cases, with considerable anxiety.

In stronger children, want of cleanliness, or temporary derangement set up by improper food, may give rise to thrush; but here, if the strength is satisfactory, recovery is usually rapid: the concretions become greyer, then yellow; fall off, and are not renewed.

Another symptom of the irritation excited by unsuitable food is that known in nurseries under the name of "inward fits." The phenomena which constitute the condition denoted by this rather vague expression, are a blueness or lividity of the upper lip, which is rather everted, and may twitch; a slight squint, or a peculiar rotation of the eye; with contraction of the fingers, and twisting inwards of the thumbs. These symptoms should never be disregarded, as they are often the precursors of an attack of convulsions.

If a great accumulation of food has taken place in the alimentary canal, or if the child has swallowed some substance which is more than usually indigestible, or has been exposed to cold, the symptoms may become more alarming. The skin gets very hot, the face flushed, and there is violent vomiting of sour-smelling food, with mucus, preceded by great retching. The efforts to vomit may continue after the stomach has been emptied, and then green or yellow bile is thrown up. At the same time the bowels become very loose, and large, dark green, or putty-like, offensive motions are passed, with great straining. The motions often contain little lumps, and each action of the bowels is preceded by much griping, during which the child screams, draws up his legs, and throws himself uneasily from side to side. The tongue is rather dry, and is thickly coated, white or yellow, with large, round, red or pink papillæ scattered over its surface, peering through the fur. The belly is full, rather hard, and irregular to the feel. The child refuses all food, but is very thirsty; he usually, however, vomits the fluid he has taken very shortly after swallowing it. Sometimes a convulsive fit ushers in this attack, and may be repeated several times. Occasionally these fits recur in such numbers, and with such violence, as to cause death by the exhaustion they induce. The vomiting usually ceases after the first day, or is repeated at longer intervals, but the diarrhœa continues for two or three days, unless treatment be quickly had recourse to, and the motions change their character, becoming watery, and usually of a brown colour, still remaining extremely offensive. If the straining be great, there may be slight prolapse of the bowel, with a little blood in the form of red streaks in the motions.

In children over twelve months old, such attacks are often accompanied by aphthæ of the mouth. These are found on the tip of the tongue, round the anterior part of its margin, and on the inside of the lower lip. They consist of small circular superficial ulcers, seated at the follicles of the mucous membrane. At the same time the lower gums are usually red, swollen, and shining; they easily bleed, and may be ulcerated along the roots of the incisor teeth. There is also increased secretion from the mucous membrane of the mouth, with some salivation. The number of the aphthæ varies from two or three to fifteen or even twenty. They are very rarely solitary; usually about five or six.

When the attack subsides, the infant, unless a better system of management be adopted, goes on as before, the wasting continues, and he becomes gradually weaker and more languid. The attacks of acute indigestion recur at short intervals, each, as it passes off, leaving him more prostrate, and less able to withstand the injurious influences which are gradually wearing away his life. His face becomes wrinkled and old-looking; his eyes dull and heavy; his expression languid, or peevish; and, as his debility increases, the griping pains to which he is still subject excite no longer a fretful cry, but only a plaintive moan, or merely a contraction of the features without any sound. His emaciation becomes extreme; his belly large; his skin harsh and dry; his fontanelle deeply depressed; and, finally, some secondary disease arises, and puts an end to his existence. Any acute disease attacking a child in such a condition is almost certainly fatal, for all resisting power has been starved out of him, and he falls a ready victim to a disorder which, in a healthy child, would be easily manageable, and quickly cured. The least catarrh runs on to bronchitis or lobular pneumonia; the slightest chill may set up an uncontrollable diarrhœa; and it is to chronic diarrhœa that the final cause of death may be most usually attributed—a diarrhœa which may last weeks, or months; and there is matter for much astonishment in the length of time a child will linger on, although reduced apparently to nothing but skin and bone. If the child has been brought up entirely by hand, and has been fed improperly from his very birth, he seldom lives longer than two or three months. If he has been suckled for some months before the commencement of the improper food, he has greater power of resistance; and although under the new diet he will soon become dull, and pale, and flabby, yet the effects upon his flesh and strength are less noticeable, and he usually drifts into rickets before any appearances have been thought sufficiently serious to require medical interference.

Treatment.—The treatment of simple wasting from insufficient nourishment consists principally in so selecting the diet of the infant, with due regard to his age and capabilities, that he may be able to digest, and therefore to be nourished by, all the food he takes. To do this, we must be thoroughly acquainted with the scale of diet suited to a healthy child from his birth onwards; we are then able to vary this diet according to the digestive power we find in our patient. The weaker the child, the more nearly does his condition resemble that of a new-born infant in his power of assimilating different articles of food, and therefore the earlier in the scale must we look for the nutriment suited to his wants.

A short sketch of this subject will, then, not be out of place.

The child ought, if possible, to be suckled by his mother, and every mother ought to make an effort to perform this duty. Should she, however, after repeated trials, prove unable to suckle, a wet-nurse must be provided, or the child must be brought up by hand. In choosing a nurse, attention should be paid to two points,—viz., the state of her health, and the age of her milk. With regard to her health, she should be examined for signs of phthisis, scrofula, or syphilis; her breasts should be inspected, and we should endeavour to estimate the condition of her milk from its appearance, by the naked eye and by the microscope. The best test, however, is the condition of her child, who should always be examined. If he is healthy and thriving, the milk is in all probability in a satisfactory state. The age of the milk is a point of considerable importance, for the farther lactation is advanced, the more casein will the milk contain, and the richer will be its quality. It is, therefore, advisable that her confinement should have taken place at about the same time with that of the mother whose place she is to supply, otherwise the milk may be unsuited to her nursling. It is often necessary to change the nurse, for, as appears, from the investigations of MM. Vernois and Becquerel, in the milk of some women the quantity of the oily constituent greatly predominates. In such cases the milk may not agree with the child. We must not rest until a nurse has been provided who is in every way fitted to make the infant strong and healthy.

The diet of the nurse should be liberal: a certain amount of fresh vegetables and fruit should be included in her meals, and she may take reasonable quantities of wine or beer.

Young mothers with a first child are sometimes awkward in the handling of their charge, and this is not unimportant. Infants held awkwardly to the breast often find a difficulty in retaining the nipple, and may refuse the breast and be very fretful on this account. The mother should not hold herself too erect, but should bend over the child so as to allow the nipple to fall easily into his mouth. The child should be placed partly on his side, and the mother should support the breast with the two first fingers of her unoccupied hand, so as to keep it steady while the child draws the milk. If the milk flows too quickly and abundantly, as sometimes happens, it may cause vomiting from the rapidity with which it has to be swallowed. In these cases she should be taught to press gently with the two fingers which hold the breast, so as to regulate the flow.

The newborn infant should be put to the breast a few hours after birth; or as soon as the mother has recovered from the first fatigues of labour. This course has several advantages: it ensures the proper contraction of the uterus, for when the child has once taken the breast, no danger from after hemorrhage is to be apprehended; the child has the benefit of the thin, watery colostrum which precedes the appearance of milk in the breast, and acts as a gentle laxative upon the bowels, clearing out the meconium with which they are loaded; and the nipple is drawn out while the breast is still soft. If suckling is delayed until the secretion of milk has become regularly established, the breast is apt to be distended by its secretion, so as almost to hide the nipple. The child has then great difficulty in obtaining a hold of the nipple, and may besides suffer much pain from the pressure of his face against the hardened gland. No food of any kind should be given to the child at this time. The practice of giving butter and sugar, gruel, &c., to a newborn babe is a mere cruelty, and must be strictly forbidden. The child should be put to the breast, even although there be no milk. There is always more or less colostrum, which forms a sufficient nourishment until the supply of milk becomes confirmed. Whether the mother is afterwards to suckle her child or not, she should endeavour at any rate to do so for the first month, during which time a fitting nurse can be secured, if a wet nurse be desired.

The child should take the breast at regular intervals, every two hours during the day for the first six weeks; and he should suck from each breast alternately. At night it is important that the mother should be undisturbed; and besides, it is well to accustom the child to quiet during the hours of sleep. He should, therefore, be fed for the last time at 11 P.M., and be then put to rest in a cot in the nurse's room, until five o'clock on the following morning, when he may again take the breast. By this means the mother is ensured six hours' uninterrupted sleep. If, during the interval, he awakes and cries, he may be pacified by a little cow's milk and water; but it is wiser, at any rate after the first few weeks, to accustom him to take nothing between the hours mentioned, for children, like their elders, are creatures of habit. The infant soon becomes used to the plan, and will wake and sleep again with perfect content if he knows that his cries will be disregarded. After six weeks the interval between the meals should be increased to three hours or even longer if the child shows no desire for the breast. It is as great a mistake to urge an infant to take nourishment as it is to quiet him with the breast whenever he cries.

The mother should be able to perceive when her child cries from hunger, and when from uneasiness or ill-temper. If the babe rouses himself and seems pleased at the sight of the mother, clenching his hands, and flexing his limbs, he is hungry. If he remains passive, he does not require the breast. If he cries peevishly, has a hot skin, and jerks his lower limbs uneasily about, he is troubled with indigestion, and the milk would only increase his discomfort.

Up to the age of six months the breast must remain the child's sole nourishment, provided that the secretion of milk, and its quality, are found to be satisfactory. If not, and the child wastes, or does not grow, other food must be given in addition, as will be afterwards described.

If the mother cannot suckle her infant, and a wet-nurse is not desired, the child must be "brought up by hand," feeding from a bottle. The practice of artificial feeding is denounced by some, and praised by others. The results of ignorant attempts to supply a substitute for human milk are no doubt sufficiently disastrous; but a diet chosen with care and given with judgment will seldom disappoint our expectations. The hand-feeding of infants differs from suckling by demanding more attention on the part of the nurse, and some tact in accurately adapting the quality of the food to the powers and requirements of the baby. To be thoroughly successful there are two points which it is important to bear continually in mind. In the first place, we must select a diet which not only contains in itself all the elements of nutrition, but which also presents them in such a form that an infant is able with perfect ease to digest and assimilate them. No food can be considered suitable to the requirements of the infant unless it contains material to supply the waste of the nitrogenous tissues: therefore a merely starchy substance, such as arrowroot, which enters so largely into the diet of children, especially amongst the poor, is a very undewhey, and sugar and cream are added in such quantities as to imitate accurately enough the proportion of casein, sugar and fat contained in human milk. But the name of "artificial human milk" is not thereby justified, for the casein, although proportionately reduced in quantity, is no easier of digestion than it was before. In order to make the milk perfectly satisfactory as a food for infants, it must be so treated that the casein is presented in a more digestible shape to the infant stomach. This object may be effected in one of two ways.

The first method consists in adding an alkali, such as lime-water, to the milk. To be of any service, however, the quantity added must be considerable; one or two teaspoonfuls—the addition usually made to a bottleful of milk and water is quite insufficient to effect the object desired. Lime-water contains only half a grain of lime to the fluid ounce; of this solution so small a quantity as two teaspoonfuls would be scarcely sufficient to neutralize the natural acidity of the milk. Lime-water, no doubt, acts by partially neutralizing the gastric juice, so that clotting of the curd is in a great measure prevented, and the milk passes little changed out of the stomach, to be fully digested by the intestinal secretions in the bowels. To attain this object at least a third part of the mixture should consist of lime-water. For a newborn infant two tablespoonfuls of milk may be diluted with an equal quantity of plain filtered water, and then be alkalinized by two tablespoonfuls of lime-water. This mixture, of which only a third part is milk, can be sweetened by the addition of a teaspoonful of sugar of milk. If thought desirable a teaspoonful of cream may be added. The whole is then put into a perfectly clean feeding-bottle, and is heated to a temperature of about 95° Fahr. by steeping the bottle in hot water. When warmed, it is ready for use. The proportion of milk can be gradually increased as the child gets older.

A second plan by which the casein of cow's milk can be rendered digestible consists in adding to the milk a small quantity of some thickening substance, such as barley-water, gelatine, or even one of the ordinary farinaceous foods. The action of all of these is the same, and is an entirely mechanical one. The thickening substance separates the particles of curd, so that they cannot run together into a solid lump, but must coagulate separately into a multitude of small masses. By this means the curd is made artificially to resemble the naturally light clot of human milk, and is almost as readily digested by the infant.

Although any thickening matter will have the mechanical effect desired of separating the particles of curd, yet it is not immaterial what substance is chosen. The question of the farinaceous feeding of infants is a very important one, for it is, as has been already remarked, to an excess of this diet that so many of their derangements may often be attributed. Owing to a mistaken notion that such foods are peculiarly light and digestible—a notion so widely prevalent, that the phrase "food for infants" has become almost synonymous with farinaceous matter—young babies are often fed, as soon as they are born, with large quantities of corn flour or arrowroot, mixed sometimes with milk, but often with water alone. Now starch, of which all the farinæ so largely consist, is digested principally by the saliva, aided by the secretion from the pancreas; two fluids which convert the starch into dextrine and grape sugar previous to absorption. But the amount of saliva formed in the newborn infant is excessively scanty, and it is not until the fourth month that the secretion becomes fully established. Again, according to the experiments of Korowin, of St. Petersburg, the pancreatic juice is almost absent in a child of a month old; even in the second month its secretion is very limited, and has little action upon starch. It is only at the end of the third month that its action upon starch becomes sufficiently powerful to furnish material for a quantitative examination of the sugar formed. Therefore, before the age of three months a farinaceous diet is not to be recommended as a food for infants, unless the starchy substance be given with great caution, and in very small quantities. If administered recklessly, as it too often is, the food lies undigested in the bowels, ferments, and sets up a state of acid indigestion, which in so young and feeble a being may lead to the most disastrous consequences. In fact, the deaths of many children under two or three months old can be often attributed to no other cause than a purely functional abdominal derangement, excited and maintained by too liberal feeding with farinaceous matters. There is, however, one form of food which, although farinaceous, is yet well digested by even young infants, if given in moderate quantities. This is barley-water. The starch it contains is small in amount, and is held in a state of very fine division. When barley-water* is mixed with milk in equal proportions, it ensures a fine separation of the curd, and is at the same time a harmless addition to the diet. Instead of barley-water, gelatine† may be made use of, and will be found to answer the purpose well.

Farinaceous foods in general are, as has been said, injurious to young babies, on account of the deficiency

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[*] To prepare the barley-water—put two good teaspoonfuls of washed pearl barley with a pint of cold water into a saucepan, and simmer slowly down to two-thirds. Strain. It should not be allowed to boil violently. Barley-water does not keep fresh beyond a few hours. It should therefore be made twice a day. Once made, it must not be heated to boiling point or it rapidly turns sour.

[†] To prepare gelatine—put a teaspoonful of gelatine into half a tumbler of cold water, and let it stand for three hours. Then turn the gelatine and water into a teacup ; stand this in a saucepan half full of water, and boil till the gelatine is dissolved. When cold this forms a jelly, of which a teaspoonful is to be added to half a bottleful of milk and water.

during the first months of life of the secretions necessary for the conversion of the starch into dextrine and grape sugar. If, however, we can make such an addition to the food as will ensure the necessary chemical change, farinaceous matter ceases to be injurious. It has been found that by adding to it malt in certain proportions, the same change is excited in the starch artificially, as is produced naturally by the salivary and pancreatic secretions during the process of digestion. The employment of malt for this purpose was first suggested by Mialhe, in a paper read before the French Academy in 1845, and the suggestion was put into practice by Liebig fifteen years later.

Many of the leading chemists now prepare malted foods. These differ from each other only in the proportion they contain of unconverted starch. For the young infant that food is most suitable in which the starch is most completely converted into dextrine. It is for this reason that Mellin's food is so valuable a resource. This food is found on analysis to contain absolutely no starch at all, the whole having been converted during its preparation into dextrine and glucose. A teaspoonful of Mellin's food, mixed with milk and barley-water in equal quantities, is, as a rule, readily digested by the youngest infants. It very rarely, indeed, happens that it is found to disagree. Instead of malt, pancreatine may be employed as the digesting agent of starch. This plan has been adopted with great success by Mr. Benger. In Benger's food the farinaceous meal, finely ground and well cooked, is mixed with pancreatine. When the food is added to warm milk or milk and water, the digestive principle not only converts the starch more or less completely into dextrine, but also acts upon the casein, reducing it to a form in which it is as readily digestible as the curd of human milk. The food is a very good one and usually agrees well.

In all cases, then, where a child is brought up by hand, milk should enter largely into his diet, and during the first few months of life he should be fed upon it almost entirely. If he can digest plain milk and water, there is no reason for making any other addition than that of a little milk sugar, and cream; but in cases where, as usually happens, the heavy curd taxes his gastric powers too severely, the milk may be diluted with an equal proportion of barley-water; or may be thickened by adding to each quantity of milk and water a teaspoonful of gelatine and of Mellin's food; or may be alkalinized with lime-water, as already described.

Having fixed upon the kind of food which is suitable to the child, we must next be careful that it is not given in too large quantities, or that the meals are not repeated too frequently. If the stomach be kept constantly overloaded, even with a digestible diet, the effect is almost as injurious as if the child were fed upon less digestible food in more reasonable quantities. A young infant passes the greater part of his time asleep, waking at intervals to take nourishment. These intervals must not be allowed to be too short, and it is a great mistake to accustom a child to take food whenever he cries. From three to four ounces of liquid will be a sufficient quantity during the first six weeks of life; and of this only a half, or even a third part, should consist of milk, according to the child's power of digestion. After such a meal the infant should sleep quietly for at least two hours. Fretfulness or irritability in a very young baby almost always indicates indigestion and flatulence; and if a child cries and whines uneasily, twisting about his body and jerking his limbs, a fresh meal given instantly, although it may quiet him for the moment, will, after a short time, only increase his discomfort. During the first six weeks or two months two hours will be a sufficient interval between the meals. Afterwards the interval can be lengthened, and at the same time a larger quantity may be given at each time of feeding. No more food should be prepared at one time than is required for the particular meal. The position of the child as he takes food should be half reclining, as when he is applied to his mother's breast, and the food should be given from a feeding-bottle. When the contents of the bottle are exhausted, the child should not be allowed to continue sucking at an empty vessel, as by this means air is swallowed, which may afterwards be a source of great discomfort. The feeding apparatus must be kept perfectly clean. The bottle should be washed out after each meal with water containing a little soda in solution, and must then lie in cold water until again wanted. It is desirable to have two bottles, which can be used alternately.

With some children, in spite of all possible precautions, cow's milk, however carefully it may be prepared and administered, cannot be digested. Soon after being swallowed it ferments, and either excites vomiting or produces great flatulence and discomfort, while the general nutrition of the child becomes slowly impaired. This incapacity for digesting cow's milk may be a natural peculiarity of the child, but more often it is a merely temporary infirmity. In the former case, which is fortunately a rare one, no amount of preparation seems capable of rendering the milk digestible. So long as it is being taken, the child wastes slowly; he is restless and uneasy by day, and excessively fretful by night, and appears to be tormented constantly by abdominal pains. In such cases, if there are objections to a wet nurse, recourse must be had to the milk of some other animal; and preference should be given to a milk which contains a smaller proportion of casein than is found in the milk of the cow, such as goat's or ass's milk.* Either of these will do and will often agree, especially if a third or a fourth part of barley-water be added; or a teaspoonful of Mellin's food may be dissolved in either of these milks diluted with an equal part of water. The addition of one or two teaspoonfuls of an aromatic water, as dill or caraway-seed[*] water, is also of service. It should never be omitted if there is much tendency to flatulence. Goat's milk often has the strong flavour peculiar to the animal, but this is not objected to by infants; moreover, it may be removed to a certain extent by boiling. Ass's milk is sometimes found to have slight laxative properties, but in this case also boiling the milk will often remove the disadvantage. A milk which is very useful for infants and others who cannot digest ordinary milk is obtained by re-milking the cow after the ordinary daily supply has been withdrawn. The residuum thus obtained goes in some parts of the country by the

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* The relation of these milks to each other and to human and cow's milk is shown in the following table. The analysis of the first three

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milks is from Dr. Frankland's work, "Experimental Researches on Chemistry"; that of goat's milk is by Mr. A. W. Stokes.

	CASEIN.	BUTTER.	SUGAR.	SALTS.
Woman	2·7	3·5	5·0	·2
Cow	4·2	3·8	3·8	·7
Ass	1·7	1·3	4·5	·5
Goat	2·87	5·13	4·69	·87

[*] A perfectly useful caraway-seed water may be made in the nursery, boiling two teaspoonfuls of crushed caraway seeds, enclosed in a little muslin bag, in a pint of water, until the quantity is reduced to one-half.

name of "strippings." It is very rich in cream, but comparatively poor in curd. One part of this diluted with two parts of water will in almost all cases agree well; or one part of milk may be replaced by barley-water if there appears to be any difficulty in digesting the casein.

In cases such as these, too, condensed milk is at first often successful. Condensed milk is merely cow's milk deprived of a considerable proportion of its water, and sweetened, in order that it may keep better, with cane sugar. This milk, given freely diluted, will often be tolerated when fresh cow's milk turns acid and disagrees. At first, the strength used should be in the proportion of one teaspoonful of the milk to a teacupful of warm water. Infants immediately after birth almost invariably do well upon condensed milk. On this account it is a great favourite with monthly nurses, more especially as, owing to the large quantity of sugar it contains, the milk is very fattening, and often gives a deceptive appearance of strength. The most useful form, however, of condensed milk contains no sugar at all. This preparation is made by Messrs. Loeflund and Co., and is called "Kindermilch." In it the preserving agent is an unfermented extract of wheat, all the starch of which has been converted into dextrine and maltose, so that the food is entirely free from starchy matter and cane sugar. This milk, diluted in the ordinary way with warm water, will often agree when ordinary condensed milk cannot be borne. But preserved milk, however digestible it may be, is no efficient substitute for the fresh milk of the cow. Children who are fed for too long a time upon tinned foods often become rickety, and sometimes develop symptoms of scurvy. In no case should an infant be allowed to depend for nourishment upon preserved milk longer than is absolutely necessary. As soon as possible this food must be replaced by fresh cow's milk diluted with barley-water.

In all cases where a difficulty is found in digesting ordinary cow's milk we should make trial of peptonised milk prepared according to the plan of Dr. W. Roberts. In milk so prepared the curd is digested by the action of pancreatine. An important drawback to this method, when the ordinary directions are followed and a large quantity is prepared at one time, is the bitter taste given to the milk by the pancreatine. To overcome this objection I am in the habit of ordering each meal to be prepared separately in the following way:—"Put the milk or milk and water into a small saucepan and heat over a spirit-lamp. When the temperature reaches 140° (as shown by a thermometer), blow out the lamp and stir up with the milk a good pinch of bicarbonate of soda, and Benger's solution of pancreatine in the proportion of fourteen minims to each ounce of milk. Let the pan stand *uncovered* for twenty minutes." The milk is now ready for use and must be given at once. It can be sweetened by the addition of half a teaspoonful of extract of malt. So prepared, the milk is not bitter, and will often be taken readily and digested perfectly by babies who can take it in no other form.

All infants are liable to temporary derangements, by which the digestive power is for the time reduced; and, unless some modification be quickly made in the diet, nutrition becomes seriously impaired. The occurrence of gastric catarrh is the principal difficulty to be contended with in the hand-feeding of infants. If a food be continued after it has begun to disagree, a catarrh of the delicate mucous membrane is almost inevitably set up. When this derangement is once established, a change in the diet will not be necessarily followed by improvement, as the tendency to acid fermentation of food, which is one of the chief characteristics of this disorder—owing to a large increase in the mucous secretion—still remains, and is encouraged by every additional quantity of fermentable matter which may be swallowed. A sour smell from the child's mouth is a certain sign that this fermenting process is in existence, and measures should at once be taken to put a stop to so injurious a condition. A reduction in the quantity of milk is often an essential step in such treatment; and if the case be a severe one, and the fermenting process active, it may be necessary, for a day or two, entirely to exclude milk from the diet. Its place must be taken by mixtures of whey and barley-water in equal parts; freshly made veal broth (half a pound of meat to the pint), and barley-water (equal parts), or Mellin's food dissolved in whey or barley-water. After a day or two, and when all signs of fermentation have ceased, the milk may be returned to, but it should be given cautiously at the beginning, and in small quantities; and the first symptom of discomfort is a sign that the quantity must be reduced.

In every case where milk is found to disagree, we should be careful to satisfy ourselves that it is really the milk which is at fault, and not its method of preparation, or the way in which it is given. Too large a quantity may have been given at once, or the meals may have been too frequently repeated; or the food, originally sweet, may from keeping have turned sour. The practice of preparing in the morning the whole day's supply of food, is a very dangerous one. It rarely happens at the close of the day, that such food is fit for the child's consumption.* Again, the whole secret may lie in a want of cleanliness of the feeding apparatus. Amongst the poorer classes so common is this fault, that it is really the exception to find a perfectly clean feeding-bottle, and a large proportion of the deaths amongst their children may be traced to this carelessness alone. Even amongst the wealthier classes, in cases where the direction of the child's meals is left entirely to servants, the necessary cleanliness is not so common as could be wished. The first care of the medical attendant when called to a child brought up by hand, should be to send for the feeding-bottle, and to satisfy himself by his sense of smell that it is fit for use.

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* Dr. Baginsky, of Berlin, found that when human milk, cow's milk, condensed milk (Swiss), two varieties of farinaceous food, and two specimens of prepared infants' food, were separately exposed for twenty-four hours to a temperature of 67° Fahr., the two first remained unchanged, except that the cow's milk had become slightly acid. On the other hand, the Swiss milk, the farinaceous, and the infants' foods, although apparently fresh, had a strongly acid reaction, and exhibited under the microscope bacteria in active motion.

When a child is six months old, farinaceous food may be given without danger, and will indeed be a useful addition to his diet. The kind of food to be chosen is of considerable importance, and in the selection we have to consider not only what food is best in itself, but also what food is best digested by the child. The same food may not agree equally well with different infants, and in cases where our first trial is unsatisfactory, it may be necessary to change the food several times before we have found the one which is suited to the particular case.

The farinæ contain nitrogenous matter, starch and salts in varying proportions, and those of them are best suited as food for infants, which approximate most nearly to milk, the natural diet of the child, in the relative proportion of their several constituents. Thus the relation of the nitrogenous, or nutritive element to the calorifiant, is in human milk as one to four; in wheaten flour one to five; in potatoes one to nine; in rice one to ten; and in arrowroot, tapioca, and sago, one to twenty. The calorifiant matter exists in farinaceous substances in the form of starch, which during the digestive process becomes converted into sugar before being taken up by the absorbent vessels. But that this change should take place, it is important that, by proper preparation, the starch granules should be brought into a suitable condition, so as to be readily acted on by the digestive organs.

The food which is best in itself, and which generally is found to agree, is wheaten flour. The best form in which this can be given is the preparation of wheat known as "Chapman's Entire Wheaten Flour." This is superior for the purpose to the ordinary flour, as it contains the inner husk of the wheat, finely ground, and is, therefore, rich in phosphates, and in a peculiar body called cerealin, which has the diastasic property of changing starchy matters into dextrine. The flour is to be baked in the following way:—A covered earthenware jar filled with the flour is put into a slow oven. From time to time it is removed, and the contents stirred up from the bottom and sides so as to prevent the formation of hard lumps. When thoroughly baked the flour forms a soft greyish-coloured powder. A child of six months old will digest two meals a day of this flour, but seldom more, and in many cases a single meal of it will be found sufficient. For each meal one teaspoonful of the prepared flour is rubbed up with a tablespoonful of cold milk into a smooth paste. A second spoonful of cold milk is then added, and the rubbing is repeated until the mixture has the appearance of a perfectly smooth cream. A quarter of a pint of hot milk or milk and water is then poured upon the mixture, stirring briskly all the time, and the food is ready for use. It may be sweetened with extract of malt instead of sugar.

If the flour, prepared as described, be found not to agree, a smaller quantity can be given, or some other farinaceous food may be tried. Any of the so-called "infants' foods" may be given to a young child, and sometimes one, sometimes another will be found to succeed; but in no case should farinaceous matter* be allowed, even when guarded with malt, oftener than twice

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* Most of the "infants' foods" contain unconverted starch. In Mellin's food, however, the whole of the starch is digested. This food, therefore, may be given without danger at any meal.

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in the day. If there be much constipation a teaspoonful of fine oatmeal may be given in the morning instead of the flour.

After the eighth month a little thin mutton or chicken broth or veal tea, may be given, carefully freed from all grease. After twelve months the child may begin to take light puddings, well-mashed potatoes with gravy, or the lightly boiled yolk of one egg; but no meat should be allowed until the child is at least sixteen months old.

The above description of the method of bringing up a child by hand is also applicable to cases where the child is being suckled on impoverished milk. In such cases the breast should be given only twice a day, his feeding at other times being conducted according to the rules laid down. A useful addition to the breast-milk, where an addition is required, during the first few weeks of life, is a mixture of cream with diluted whey. One tablespoonful of fresh cream, with twice the quantity of whey, diluted with two tablespoonfuls of hot water, may be given from a feeding-bottle every three or four hours. After a few weeks a tablespoonful of milk may be added, and this quantity can be afterwards gradually increased.

The time of *weaning* is very important. To deprive a child prematurely of the breast is not without its dangers, but to persist too long in nursing is a fruitful source of evil. In ordinary cases, where the child is healthy, and the strength of the mother is sufficient for the task, twelve months should be allowed to elapse before the child is weaned. A longer continuance of suckling would make too great a demand upon the strength of the mother, and would be of no advantage to the child, who has by this time become well accustomed to other food. It is sometimes stated, particularly by French authors, that the time of weaning should be regulated by the progress of dentition; that the child should not be deprived of the breast until the period has passed during which the accidents attendant upon dentition may be expected,—which time they fix at the evolution of the canine teeth. This, however, is not a very safe guide, as rickets, a common result of mal-nutrition, may postpone indefinitely the evolution of the teeth. In these cases, to continue the suckling would be to encourage the very evil which it is our principal object to prevent. The existence of chronic disease in an infant reared entirely by the breast, so far from being an impediment to weaning, is, on the contrary, the very strongest argument in favour of a change of diet: and the common objection of mothers that, on account of the child's weakness, they "dare not wean him," is the very worst objection that could be possibly urged, and is a sufficient proof that the suckling has already been continued far too long. Human milk is the best food for infants, not on account of any specific property it possesses, but merely because it is the most digestible. When, however, it is so poor as to be no longer nutritious, it ceases to rank as food; and by pursuing this course we fill the child's stomach with a fluid which is incapable of nourishing him, but which, by satisfying his appetite for the moment, prevents his taking a meal which would be really beneficial.

In every case we must attend, not to popular prejudice, but to the actual condition of the child. Wasting in a non-syphilitic infant shows the necessity for some change in the diet. But this change does not, unless the child be twelve months old, consist necessarily in weaning. His condition may be owing to a too liberal, or to a too scanty, supply of food; and we must make him depend more upon the breast-milk, or less upon that source of nourishment, according as to which of these two causes a history of his previous diet leads us to attribute his disease.

In giving additional food to children at the breast, a

Mchd G. Fairbairn

difficulty often arises from the repugnance of the child himself to this mode of feeding. Many children, particularly those who have been suckled too frequently, and to whom the breast has been offered as a means of quieting their cries, greatly prefer this way of taking nourishment to any other, and indeed continually refuse it in any other form. In these cases, should the mother's milk be poor in quality (which it often is, although very abundant) it is better, if all other means fail, to wean the child suddenly, as this offers the only plan by which he can be efficiently nourished. This course, however, should only be resorted to when, in spite of great perseverance, we have not succeeded in attaining our object. A little judicious starvation will often do much.

Although, if circumstances allow it, the child should be suckled for twelve months, yet it may be necessary to wean him at an earlier period, thus—

If the mother's health suffers from nursing;

If from some cause, as pregnancy, or the occurrence of acute disease, her milk is rendered unwholesome to the child;

If the child is insufficiently nourished upon the breast-milk, and yet refuses to take additional food.

In all these cases the ordinary time of weaning must be anticipated.

A moment should be chosen for weaning when the child is not feverish, nor suffering pain from the actual cutting of a tooth. It is best to wean him gradually, lessening by degrees the number of the times he is allowed to take the breast, and continuing, for about a week, still to give it to him once a day; after which this, too, must be stopped. If the child has been fed as directed, there is very little difficulty about weaning; he may be fretful for a few days, and even refuse his food, but by perseverance he becomes reconciled to his loss.

Children sometimes wean themselves, seeming suddenly to take a dislike to the breast, although they are quite healthy and are apparently thriving upon the milk. This, however, may be sometimes occasioned by scantiness of the milk. Usually, when children refuse the breast, some cause may be discovered by which the process of sucking is rendered difficult or painful. Thus—

Retraction of the nipple may make it impossible for the child to obtain any milk until the nipple has been drawn out by a stronger child, by a cupping-glass, or by the mouth of the nurse.

Colic, or ear-ache, when severe, prevents the child from sucking until the pain has subsided. In milder cases of abdominal discomfort, infants are, however, often particularly ravenous, as before explained.

Thrush, or aphthæ of the mouth, may have the same effect. Here the pain caused by the movements of the mouth during the act of sucking is the reason of the refusal.

Closure of the nares from syphilitic swelling and incrustation, or from measles, obliges the child to breathe entirely through the mouth. Here, whenever he attempts to take the breast, a sense of suffocation compels him to abandon the nipple.

In bronchitis, pneumonia, and broncho-pneumonia, the child sometimes refuses the breast; for there is laborious respiration, and both nose and mouth are wanted for air-passages.

In tongue-tie * and cleft palate, there is a mechanical obstacle to sucking, in the impossibility of producing the necessary vacuum in the mouth. The former is readily cured by snipping the frænum. The latter necessitates

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* By "tongue-tie" is here meant those cases where the frænum is attached to the whole under surface of the tongue as far as the tip. Such cases are exceedingly rare. The ordinary cases of so-called tongue-tie present no real obstacle to sucking, and need not be interfered with.

artificial feeding; but by an ingenious and simple contrivance, designed by Mr. Oakley Coles, the impediment to sucking from a feeding-bottle can be overcome, although the child is still prevented from taking the breast. The plan consists in attaching to the nipple of the feeding-bottle a flap of elastic india-rubber, cut to fit the roof of the mouth. This flap, shaped like the bowl of a teaspoon, is cut out of thin sheet elastic, and is sewn to the upper part of the stalk of the nipple where this projects from the shield. In the mouth of the infant the flap forms an artificial palate, against which the nipple is pressed during suction, and the fluid is thus prevented from passing into the nose in the act of swallowing.

Infants who have been brought up at the breast without the addition of any other food are sometimes difficult to wean, as the new food does not always agree. Accustomed as such children are to the light human milk, the firm curd of cow's milk proves a heavy tax upon their digestive powers, and unless the change be made with care serious dangers may arise. In these cases the milk should be diluted with barley-water, or thickened with Mellin's or some other infants' food.

When the child has become accustomed to do without the breast-milk, he may begin to take the food which is hereafter to form his ordinary diet. Potatoes carefully mashed with a spoon, with gravy; meat broths; light puddings; eggs very lightly boiled; or a bone to suck, may be allowed. No meat, however, should be given till the sixteenth or eighteenth month, when he may begin with a very small quantity once in the day. The best kind is a small piece of roast mutton, without any fat or grease. This should be very finely minced, or even pounded in a mortar to ensure fine division, for a young child will not chew his food. With this he may drink plain water, toast-water, or milk-and-water.

For further information on the subject of feeding children, see Chap. XI., Diets 1–11.

In making the various changes in the diet, it is important to watch the child carefully, so that too great precipitancy may be avoided. Any signs of laboured digestion should be carefully noted, and a simpler diet at once returned to. The child when awake should be active and cheerful, and his sleep should be tranquil and undisturbed.

While attention is thus paid to diet, all the other precautions, indispensable to perfect health, should be observed.

The greatest cleanliness must be maintained. Every morning the whole body should be well washed with soap * and warm water, and should be bathed every evening with tepid water before the child is put to bed. After each bath the body and limbs should be gently rubbed with the hand. The younger the child the warmer should be the water employed. At first the temperature should be about 90° Fahr., but after a few months it may be gradually used cooler, although it should never be lower than 60° Fahr. Soap is required thoroughly to remove the tenacious cutaneous secretions and the dirt. The use of soap is said by some writers to make the skin too dry, and subject to cracks, but if frictions are used after each bath this objection is removed, as the skin is thus excited gently to act, and remains sufficiently lubricated. His napkins should be changed sufficiently often, and the nates after each action of the bowels should be well sponged with warm water and carefully dried. He should sleep by himself in a little cot, without curtains; not in the same bed with his nurse. The nurseries should be large and well ventilated, but not too hot, especially at night. They should face

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* The best soap for use in a nursery is the common unscented curd soap.

the south, if possible, as sunlight is of great importance. He should be taken out frequently into the air, whenever the weather permits. His out-door dress should be warm, and as a further protection against the cold, he should wear a flannel bandage round the belly.

From the sketch given in the preceding pages of the scale of diet suited to a healthy child, it is easy so to arrange the number and quality of his meals that a sufficient amount of nourishment may be given without overtasking his digestive powers. When the diet has been properly regulated, the child is found rapidly to regain flesh, his peevishness and irritability disappear, and his health returns. Any digestive derangement which may occur should be at once attended to, and, as this is usually due to some deviation from the prescribed rules, a return to the proper diet will generally cause it quickly to disappear, especially if a gentle laxative be given at the same time.

The constipation which is so common a result of improper food, often continues after the change of diet. In these cases, if the child be at the breast, the mother may take an occasional saline aperient, and increase the quantity of fresh vegetables to her meals. Should this plan fail in relieving the child, a teaspoonful of castor oil can be given; or a few grains of magnesia may be administered, with syrup of ginger, in some aromatic water; or a little manna may be dissolved in hot water, strained, and added to the food in the bottle. If, after repeated attempts, we find that a daily action of the bowels cannot be obtained, without a daily repetition of the aperient, it is useful to give small doses of senna combined with a bitter tonic. Thus a third part of infusion of senna may be added to two-thirds of the compound infusion of gentian. Of this mixture a teaspoonful given two or three times a day will soon regulate the bowels, so that after a time the medicine can be gradually discontinued. The value of this remedy is increased by the addition of five or ten drops of tincture of belladonna and half a drop of tincture of nux vomica.

In cases where the constipation is very obstinate; where hard clay-coloured motions, often mottled with streaks of green, are passed at rare intervals, with violent and painful expulsive efforts, two, three, or more drops of a solution containing one grain of podophyllin in a drachm of alcohol may be given to the infant in a little glycerine every night. This treatment restores the natural colour to the motions, removes the abnormal distension, and eases the colic. A less disagreeable remedy is sulphur. Curiously small doses of this drug will prove effectual if given regularly. In the case of most children half a grain given every night at bedtime will produce a regular action of the bowels. Another useful drug is the liquid extract of Cascara Sagrada. Like the others, this remedy is best given in one dose at bedtime. A young baby may begin with five drops in a teaspoonful of water sweetened with glycerine. If this quantity do not produce a sufficient movement, the dose can be increased every night by one drop until the desired result be attained. The saline aperients are favourite remedies with some practitioners, but these salts should not be used indiscriminately. They are especially indicated in cases where the stools are habitually dry. When constipation results from this lack of moisture a few grains of the sulphate or carbonate of magnesia given two or three times a day will soon induce copious relief. Afterwards, one dose administered every evening will usually keep up a sufficient action of the bowels.

Enemata are often very serviceable, administered either alone, or as an aid to the action of purgatives taken by the mouth. Two or three drachms of castor oil, with six or eight ounces of thin, warm gruel, may be used for a child of twelve months old. In using injections, the tube must be well oiled, and must be very carefully introduced, remembering that the bowel inclines gradually to the left side. The fluid should be thrown up with moderate force.

Other means of obtaining a satisfactory movement of the bowels consist in the use of suppositories of castile soap, and in frictions over the belly with a stimulating liniment. The addition of aloes to the liniment is said to render the effects of the application more decided; thus, half an ounce of the compound tincture of aloes combined with twice the quantity of compound soap liniment forms a useful embrocation for this purpose. It may be rubbed into the belly every morning. Probably the value of this mode of treatment lies not so much in the liniment as in the friction. Methodical kneading of the abdomen has long been recognized as a useful remedy in cases of habitual constipation. But the rubbing to be effectual must be employed systematically. It should consist of firm pressure with the thumbs carried round the belly in the course of the large intestine, varied occasionally by circular friction round the umbilicus with the palm of the hand. Such manipulation carried out energetically (but not violently) every morning, for five or more minutes after the bath, will often induce regularity of action in a surprisingly short time.

In children who suffer from habitual constipation, care should be taken to keep the feet perfectly warm. A warm bath will often produce an action of the bowels when aperients have been given without any effect. If the child be old enough to take farinaceous food, a morning meal of milk thickened with a teaspoonful of fine oatmeal will often render the administration of drugs unnecessary.

Rhubarb should not be used as an aperient for children where the constipation is obstinate, unless combined with jalap or scammony, or some other purgative, on account of its after-astringent effects; but for the same reason it is extremely valuable in the looseness of the bowels which is the result of acidity. Acidity is produced by fermentation of the food in the alimentary canal, and gives rise to much flatulence, shown by sour-smelling eructations, and griping pains in the belly. In these cases the feeding apparatus should always be examined. A want of cleanliness in the bottle is a common cause of this teasing derangement. If the griping is accompanied by constipation, the bowels should be opened by a gentle purge, as magnesia and senna, or castor oil, after which the following mixture may be ordered:—

℞. Sodæ bicarb. gr. iij,
Tinct. nucis vomicæ gutta ¼,
Tinct. card. co. ♏v,
Sp. chloroformi ♏ij;
Aq. ad ʒj. M. Ft. haustus.
To be taken every six hours.

Aromatics are very useful in these cases, and indeed should always be included in mixtures for children wherever there are any signs of intestinal irritation.

The following case well illustrates the value of alkalies and aromatics, conjoined with a regulated diet, in the treatment of simple atrophy accompanied by constipation and flatulence.

George M., aged two months, has been pining away ever since birth. "Is not half the size he was." Does not cry loudly but "frets and pines." Is suckled, but the mother has very little milk; is therefore fed besides on sago and corn flour made with water.

Child is bright-looking, but very small and thin. Fontanelle depressed. Lips rather pale. Nasal furrow not marked. Tongue clean, colour of rust of iron. Skin cool, not rough or harsh; a little eczema about folds of groin. Anus a little red, but no cracks or fissures there. Does not snuffle. Is not sick. Bowels act once or twice a day. Motions in little light-coloured lumps with mucus, not offensive, passed with some straining. Moves legs uneasily, as if griped.

Was ordered to be fed on milk and lime-water, in equal proportions, given every three hours. No other food except breast-milk. A flannel bandage to be applied round the belly. The following draught to be given three times a day :—

℞. Sodæ bicarb. gr. iij,
Sp. chloroformi ♏ij,
Aq. menthæ piper., ♏x,
Aquam ad ʒj. M. Ft. haustus.

At the next visit, a week afterwards :—Continues to waste. Sometimes refuses the bottle and the breast, apparently from the pains in belly. Belly very hard; child wrinkles forehead, draws up the corners of his lips, and flexes thighs on abdomen. Bowels open twice a day with straining. Motions light-coloured, solid, and smell sour; no mucus. Feet examined, and found to be very cold. Tongue clean.

Feet to be kept warm by friction with the hand. The milk and lime-water to be continued.

℞. Pulv. rhæi,
Sodæ bicarb. āā gr. iij ft. pulv. to be taken at once.
℞. Bismuthi carb., gr. ij,
Pulv. cretæ aromat., gr. iij,
Glycerine ♏v,
Mucilaginis, ♏x.
Aquam ad ʒj. Ft. haustus.
To be taken three times a day.

On the following week :—Child very much better; is beginning to gain flesh. Motions still light-coloured and rather firm, two in the day. Still rather flatulent; turns "deadly white" at times (when violently griped).

To continue the same diet. Half a drop of Tinct. capsici added to each dose of the mixture.

After this the flatulence ceased; the motions became natural; and the child rapidly became fat and well.

If the bowels, instead of being confined, are rather loose, with dark, slimy, offensive stools, a dose of powdered rhubarb and magnesia, five grains of each, should be given, and may be followed by the above mixture, with the addition of half a drop of laudanum to each dose; or the following may be given:—

℞. Tinct. opii, ♏ss.
Ol. ricini, ♏iij;
Glycerini, ♏v;
Mucilag. acaciæ, ♏v.
Aq. ad ℥j. M. Ft. haustus.
To be taken three times a day.

This combination of castor oil with laudanum is especially valuable in the screaming fits to which badly-fed children are so liable. If there is a sour smell from the breath, a few grains of prepared chalk may be substituted in each dose for the castor oil. At the same time all farinaceous foods should be suspended for a day or two, and the diet be limited to milk and lime-water, or barley-water and milk. In all these cases of abdominal pain, the feet should be examined, for cold feet alone may be the cause of the griping. Chafing and warming the feet often stops a baby's cries; and in the "screaming fits" the soothing influence of gentle friction is very decided. Rubbing the body gently with the open hand quiets the child almost at once.

If a return to the ordinary diet is followed by the same flatulent condition, and this happens several times in succession, the food evidently does not agree with the child, and some alteration is required. Trials should be made of different kinds of foods, for, as already explained, the same food is not suited to every case. A malted food—especially Mellin's infants' food—is a great resource under such circumstances. Sometimes it is the milk which disagrees, and we are forced to discontinue it altogether, giving instead beef, veal, or mutton broth, thickened with some farinaceous food.* When the flatulence is thus obstinate, frictions with a stimulating liniment should be employed daily to the belly, the flannel bandage being removed for the purpose, and afterwards replaced. At the same time a mixture containing infusion of rhubarb, with a little tincture of myrrh, may be given twice or three times in the day, to give tone to the bowels, and increase their peristaltic action:—

℞. Infusi rhæi, ♏x ;
Syrupi zingib., ♏v ;
Tinct. myrrhæ, ♏j ;
Aq. menth. pip. ad ʒj. M. Ft. haustus.
To be taken two or three times a day.

If sickness accompanies the flatulence, a teaspoonful of ipecacuanha wine should be given to relieve the stomach; after which a mixture containing bismuth and soda may be ordered:—

℞. Bismuthi carb., gr. iij ;
Sodæ bicarb. gr. ij ;
Glycerini ♏v ;
Mucilag : tragacanth. ♏x ;
Aquam ad ʒj. M. Ft. haustus.
To be taken three times a day.

Or the mixture containing bicarbonate of soda with spirits of chloroform (see p. 59) may be used.

For ordinary attacks of colic, Dr. Boyd recommends ten drops of sp. ætheris nitrosi in a drachm of water. He states that a few minutes after this draught a discharge of flatus takes place, followed by the passage of a large quantity of urine, and the distress of the child is at an end.

When the colic is very severe, great alarm may be excited by the state of apparent collapse into which the infant is thrown. The child should be placed in a warm bath; the bowels should be relieved by an injection of warm water; and a few drops of brandy or sal volatile should be given in milk or water. On being removed from the bath, the child must be carefully dried; a hot linseed meal poultice, on which ten or fifteen drops of laudanum have been sprinkled, should be applied to the belly; and he should be then wrapped up in warm flannel. If the fontanelle remain depressed, the brandy may be repeated, and a mixture containing sal volatile with spirits of chloroform and a little bicarbonate of soda may be prescribed:—

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* See also Diets 15, 16 and 17, Chap. XI.

℞. Sodæ bicarb. gr. ij;
Sp. ammon. aromat.;
Sp. chloroformi āā ♏j;
Aq. anethi ad ʒj. M. Ft. haustus.
To be taken every three hours.

Convulsions may arise from this condition of the bowels, and can be treated in the same way. If, however, they continue, and are not relieved by the measures adopted, turpentine may be given, as recommended by Dr. Graves:—

℞. Ol. terebinthinæ, ♏j;
Ol. ricini, ♏iij;
Glycerini ♏v;
Mucilaginis acaciæ ♏v,
Aq. menth. pip. ad ʒj. M. Ft. haustus.
To be taken every three hours.

This acts on the bowels, and produces a copious discharge of urine. On recovery, great attention should be paid to the diet and bowels, that the symptoms may not return.

Thrush is readily cured by attention to cleanliness. It should be made a rule always to wash out the child's mouth immediately after a meal, to prevent any accumulation of food or milk round the gums. This is readily done with a good-sized camel's-hair brush, or a piece of linen rag dipped into warm water. Attention to this point will prevent the appearance of thrush, especially if care be taken that the nipple of the mother is perfectly clean. When thrush has appeared, an aperient should be given, composed of one grain of grey powder and two or three of powdered rhubarb. Afterwards, an antacid and aromatic mixture should be prescribed (such as the soda and sal volatile mixture given above); and the mother should be directed to cleanse the child's mouth frequently with warm water, and afterwards to apply a solution of borax in water sweetened with glycerine (ʒss. to ℥j) with a soft brush. By these means the parasite is readily destroyed.

If aphthæ form, the same attention should be paid to cleanliness; a powder of rhubarb and jalap, with a grain of hydrargyrum cum cretâ, should be given to evacuate the bowels; after which the following mixture may be prescribed:—

℞. Potas. chloratis, gr. ij;
Acidi hydrochlorici diluti ♏j;
Glycerini ♏v;
Aquam ad ʒj. M. Ft. haustus.
To be taken every four hours.

When attacks of acute indigestion come on, with hot skin, furred tongue, thirst, vomiting, and diarrhœa, accompanied by griping pain, all food must be stopped, and nothing be allowed but cold barley-water. The stomach should be relieved by an emetic of ipecacuanha, after the action of which a purgative of rhubarb and magnesia should be given to clear out irritating matters from the bowels. A mixture of tincture of catechu with aromatic confection can then be given, or the following:—

℞. Zinci oxydi, gr. j;
Pulv. cretæ aromat., gr. ij;
Glycerini ♏v;
Aq. chloroformi ad ℥j. M. Ft. haustus.
To be taken three times a day.

If the diarrhœa continues after the tongue has become clean, half a drop of laudanum can be added to each dose of either of these mixtures, or small doses of sulphuric acid may be given with opium:—

℞. Acidi sulphurici aromat., ♏ij ;
Tinct. opii, gutta j ;
Glycerini ♏v ;
Aquam carui, ad ℥j. M. Ft. haustus.
To be taken three times a day.

When the irritability of the stomach has subsided, milk and barley-water may be given, but with caution, lest the vomiting return; and, after subsidence of the fever, great prudence should be exercised in returning to the ordinary diet.

CHAPTER II.

CHRONIC DIARRHŒA.

(CHRONIC INTESTINAL CATARRH.)

CHRONIC DIARRHŒA.—May be secondary to acute disease—Or primary—When primary—Early symptoms—Increased peristaltic action of bowels—When disease established—Character of the stools—Other symptoms—Complications—Serous effusions—Pneumonia—Exanthemata—Convulsions, uncommon, except towards beginning—Thrombosis of cerebral sinuses—Death without complication—Diarrhœa may cease before death—Influence of the disease upon dentition.

Causes.—In infants—Bad hygiene—Cold—Previous acute disease—In older children—Chills—Worms—Tubercular disease of bowels.

Morbid Anatomy.—Non-tubercular—Tubercular.

Diagnosis.—Between simple and tuberculous forms.

Prognosis.—Signs—Favourable—Unfavourable.

Prevention.—Attention to diet—Avoidance of cold—Influence of dentition.

Treatment.—Diet and general management—External applications—Internal remedies—Antacids—Astringents—Enemata—Opium—Nitrate of silver—Raw-meat—Tonics.

CHRONIC diarrhœa is a common derangement in childhood, and to it a large proportion of the deaths amongst infants may be attributed. During the first two years of life a diarrhœa, when it becomes established, is very difficult to arrest, and even when the looseness of the bowels has been checked, many weeks of care may still be required to restore the alimentary canal to a healthy condition. In older children chronic diarrhœa is a less fatal disease, but it often lasts for months together, and by the interference with nutrition it occasions, may lead to very serious consequences.

Chronic diarrhœa may either occur as the sequel of an acute attack, or may begin insidiously.

In the former case it is often secondary to some acute disease, as measles or scarlatina: the exanthem being accompanied by a looseness of the bowels, which persists after the disease which originated it has passed away. Or it may begin as an attack of acute catarrhal diarrhœa, with fever, abdominal pains, and perhaps vomiting. This attack subsides for a time, but returns again and again until the chronic disease becomes established. This form of beginning is, perhaps, more common after the period of infancy has passed by: but it is occasionally seen in quite young children.

The insidious beginning is met with most frequently during the second year of life. This form of the derangement is one which it is very important to recognize early; for if promptly treated it readily yields, but if allowed to continue, becomes very obstinate and difficult of cure. There is no fever, and at first no actual diarrhœa. The stools are not very numerous, numbering only two, three, or four in the day—perhaps, even, only one in the twenty-four hours. They are pale, often of the colour and consistence of soft putty, and are sometimes evacuated with straining. The dejections may be preceded by some pain in the belly. At this stage the disease seems to consist mainly in increased peristaltic action of the intestines forcing along their contents too rapidly to allow of efficient digestion being performed. The motions are copious, and consist of curds and farinaceous matter, from the milk and food which has been swallowed, mixed with some half-liquid fæces, and, if there be much straining, with mucus and blood. The blood at this time is in the form of red streaks, and results from the rupture of small vessels about the anus in the act of straining. In such a form it is a common accompaniment of diarrhœa in children where there is much tenesmus. The stools have often an offensive sour smell. The child looks rather dispirited and dull. His complexion is pale, with a muddy or sallow tint, and his feet are habitually cold. Still, he is fairly lively, and takes his food with appetite.

This state of things may continue for a considerable time, often for several weeks, or even months. The child gradually loses flesh, and becomes paler and more languid; but there is no actual diarrhœa. The nurses on being questioned, will say that the bowels are "nicely open," and it often requires careful cross-examination of the attendants to discover the cause of the loss of flesh. In these cases, therefore, it is important to inspect the evacuations.

After a time the stools become more frequent and more liquid; but vary considerably in appearance from day to day. At one time, they are thin, watery, and brownish, like dirty water; at others, thicker and clay-coloured, like thin mud; they frequently contain mucus, free, or mixed with a grumous matter, when they are called "slimy" by nurses, and almost always present little masses of undigested food. Occasionally they contain particles of grass-green matter, from altered bile or blood, in the latter case an indication of some additional irritation of the bowel. The smell becomes more and more unpleasant, and the stools sometimes have a putrid odour which is inexpressibly offensive.

When the diarrhœa is regularly established, the tendency of the stools is to become more and more liquid, and less and less homogeneous; but there is no regular progression from bad to worse. There are alternations of improvement and relapse; sometimes the looseness is better for a day or two, and may even seem to have subsided; a relapse then takes place, and the condition of the child is as bad as before. These variations in the intensity of the diarrhœa will often be found, in the earlier periods of the disease, to coincide with variations in the temperature and degree of moisture of the air. A damp, chilly day, is usually accompanied by increased severity of the symptoms, while on a bright, clear, warm day the disease is better.

The patient begins early to waste; but unless the evacuations are very copious, the emaciation does not proceed very rapidly. He gets pale, and, after a time, of a peculiar earthy tint, which is very characteristic. The skin is dry and harsh, the eyes are hollow, the lips pale and thin, and the fontanelle is depressed. His strength diminishes, and as the disease advances he seems to lose all power of supporting himself, and lies like a log in his cot, or on his nurse's lap. Still, the appetite is usually preserved, and he will often take food eagerly whenever it is offered; but each meal is followed by a notable increase in the diarrhœa. His food, as the nurses say, seems "to pass through him directly it is swallowed." The tongue is moist, often quite natural, although sometimes the papillæ at the edges and tip appear unusually red and prominent. The belly may be quite flaccid and soft, but often becomes swollen and tense from gas generated by the fermenting food. At these times there is some pain, shown by plaintive cries, by uneasy movements of the legs, and by elevation of the corners of the mouth. The abdominal wall is never retracted, and there is seldom any tenderness on pressure.

If the diarrhœa continues, the wasting becomes more and more marked; the bones project; the cheeks get hollow; the forehead becomes wrinkled; and the aspect generally is that of a little, infirm old man. The wrinkling of the forehead is due to loss of elasticity of the skin, which retains the folds into which it is drawn. The buttocks and inner part of the thighs become red from eczema occasioned by the irritation of the urine and fæcal discharges. The appetite at this stage may be preserved, or even increased; but more often it becomes capricious, and the child, refusing milk and sop, craves for beer, or for the more tasty articles of diet which he sees eaten around him. Sometimes, however, he refuses to take any nourishment whatever. All this time there is no fever. Indeed, the temperature is lower than is natural, being often no more than 97·5° in the rectum.

The stools are now excessively frequent, ten, fifteen, twenty, or even more, in the four-and-twenty hours. There is often very great straining with each evacuation, and the bowel may even prolapse. The motions often look like chopped spinach in a dirty-brown, stinking water, and may contain blood—not in bright red streaks as at the first, but of a dirty, brownish-yellow colour, and mixed with mucus and pus. When this occurs and there is at the same time tenderness of the belly on pressure, with gurgling, the bowel is probably ulcerated.

There are certain complications liable to occur in this disease which often hasten the end.

Serous effusions may take place on account of the poverty of the blood, and the relaxed attenuated state of the coats of the vessels. They begin usually at the feet, which hang down as the child lies in his nurse's lap. The instep gets quite round, and feels doughy: the skin over it is thin, and looks almost transparent: the contrast thus presented between the thin wasted leg and the bulbous foot is very striking and peculiar. The backs of the hands and the fingers then become swollen, and occasionally the face and eyelids are also œdematous. Effusions may also take place into the serous cavities, the pleura, peritoneum, and pericardium.

Hypostatic congestion of the lungs is very liable to occur, for, as the child lies constantly upon his back, stasis of the blood takes place in the most depending parts of his lungs. Death is not at all uncommon from this cause. For the same reason, *pneumonia* is not an unfrequent complication, and, if the child is very much reduced, may exist without producing cough, or any of the other symptoms by which its presence is usually manifested.

The exanthemata are very apt to attack children the subjects of this disorder, either from the diminished resisting power of the system induced by the debility, or from such a condition as obtains in chronic diarrhœa being especially favourable to the absorption of miasmatic poisons.

Convulsions may carry off the child early in the disease. They are not, however, commonly seen in the later stages. Convulsions are very common in children in whom there is a sudden depression of the vital powers, and are therefore frequently seen in acute diarrhœa, where there is a great and rapid drain upon the system. In these cases, however, where the debility is produced more gradually, although a greater degree of prostration may be reached, convulsions are rare, for the child then assumes some of the physiological characters of old age, and is much less liable to be affected by reflex stimuli.

Thrombosis of the cerebral sinuses may be a cause of death. In these cases, the child dies with symptoms of suffocation, or falls into a state of stupor, with dilated pupils, occasional strabismus, contraction of the muscles of the nape of the neck, fulness of one or both jugular veins, and sometimes paralysis of the facial nerve on one side of the face.

Some interesting cases of this complication are given by Dr. Von Dusch, in his paper on this subject.* On post-mortem examination clots are found in one of the sinuses—usually the longitudinal—plugging its channel. These clots are more or less discoloured; may be laminated in structure; completely fill the sinus; and adhere more or less firmly to its walls. The veins opening into the obstructed sinus are distended with blood.

The cause of the plugging is thus explained. The profuse watery discharge from the bowel produces inspissation of the blood at the same time that it diminishes its quantity. Absorption of water then takes place from the substance of the brain, decreasing its volume. As a consequence, the fontanelle sinks in, and the bones at the sutures overlap from the pressure of the atmosphere endeavouring to fill up the resulting space. If this is not enough to compensate for the lessened volume in the interior of the skull, the vessels of the brain and the sinuses become distended with blood. Now the rapidity of the current of blood in the sinuses is, even in a healthy state of the body, comparatively slight; partly on account of the dilatations in their calibre, and the projecting partitions in their walls; partly on account of the increased friction between the blood and the sides of the channel, caused by the angular form of the sinuses. If, then, this natural sluggishness of the current is increased by the diminution in the general mass of blood, and its inspissation—which result from the diarrhœa, and also by the weakened force of the heart's action—which is a consequence of the debility, we have a condition set up which is particularly favourable to the occurrence of thrombosis in these sinuses.

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* New Sydenham Society. 1861.

That the clotting of the blood is not a post-mortem change is shown by the colour, or rather want of colour, of the plug, by its laminated structure, and by the fact of its completely filling, and being adherent to, the sides of the sinus. That it is not due to inflammation is shown by the absence of all traces of inflammation in the walls around it.

When the disease terminates fatally the child often dies from one of the above causes. Sometimes, however, he sinks and dies without our being able to say that any of these complications are present. In these cases the emaciation becomes extreme. The eyes, deeply sunken in their sockets, have a dull, ghastly look; the cheek-bones project; the cheeks sink in; the nose looks sharpened; a furrow passes on each side from the upper part of the ala of the nose, and forms a rough semicircle round the corners of the mouth; the lips are red, cracked, and covered with sordes; and the inside of the cheeks and lips, and the surface of the tongue, become aphthous, or are covered with thrush. The tongue becomes dry, and, when free from thrush, is apt to have a granular appearance from projecting papillæ. The complexion is dull and earthy-looking, and the skin seems tightened over the projecting bones of the face. The fontanelle is deeply depressed. The body generally appears to consist of little more than the bones covered by the dry, rough, flaccid skin; each rib stands out sharp and distinct on the wasted chest. The belly may be flaccid, but more usually is full and prominent, as the emaciated and relaxed walls yield before the pressure of the flatus in the bowels. The skin of the abdomen becomes of a dirty-brown colour, or is speckled with brownish spots. The feet and hands are cold, and often look purple even when not actually cold to the touch. The child lies quiet, with eyes half closed and dim. Occasionally he draws up the corners of his lips, and wrinkles his brow as if to cry, but makes no sound; but for this plaintive sign, and for his slow, quiet breathing, he might be thought to be dead. In these cases death takes place almost without a struggle, and it is often difficult to say at what precise moment the child ceases to exist.

Sometimes for a few days before death the evacuations entirely cease, but no false hopes should be raised by this change, if a corresponding amendment does not take place in the general symptoms.

In cases of recovery the stools gradually become more homogeneous, more solid, and more fæcal, and one great sign of improvement is the reappearance of bile in the stools. The child at the same time becomes less torpid;

intensity of the diarrhœa will almost invariably be found to follow changes in the weather. A damp cold day increases the severity of the complaint, while dryer and warmer weather is followed by temporary improvement.

A variety of this diarrhœa is not uncommon, the peculiarity of which consists in the fact that the motions contain little fæcal matter, but are composed almost entirely of undigested food, mixed with mucus, so as to present a slimy appearance. These motions are passed very shortly after, or even during, a meal; the food taken appears to be forced with extraordinary rapidity along the digestive tract, and to be voided in almost the same state in which it was swallowed. The condition which gives rise to this looseness of the bowels is no doubt an unnatural briskness of peristaltic action. The intestines are in a state of great irritability, so that food taken into the stomach is at once conducted along the alimentary canal with a rapidity which allows little digestion to take place during its passage.

The bowels act three, four, or more times within twenty-four hours. There is almost always an evacuation in the morning on first rising from bed, and afterwards in the course of the day each meal is at once followed by a like movement of the bowels; the child having often to leave the table hurriedly, and frequently before the repast is actually concluded. Each motion is preceded by griping pains in the belly, and is characterized by excessive urgency, the patient having great difficulty to restrain his desire during the time necessary to enable him to reach the closet. These griping pains are not always followed by a stool, but may come on and go off at irregular times in the course of the day without any result. Sometimes, however, they are accompanied by a desire to go to stool, although no motion is actually passed. The tongue may be a little furred, but is usually clean, and is often red at the tip and sides, the redness being due to small crimson papillæ, which are sometimes slightly elevated.

This variety of diarrhœa is found in children of from three or four to nine or ten years of age. It often causes marked wasting, and the evident ill-health of the child excites great anxiety amongst his friends. Still, in many cases, special inquiry has to be made into the condition of the bowels, for, as the evacuations are not numerous, the state of the digestive organs excites little attention, and the existence of looseness is often not even hinted at by the mother in her account of her child's illness.

Causes.—Chronic diarrhœa may usually be traced to three different sets of causes, viz., bad hygienic conditions, impressions of cold, and the occurrence of some previous acute disease.

The disorder is very apt to attack children who are exposed to bad hygienic conditions, and the younger the infant at the time when these injurious influences are at work the more liable is he to suffer from their effects in this particular way.

Improper food has already been strongly insisted on as a cause of defective nutrition in the child, and by the weakness which it invariably induces would alone render him less able to resist any other pernicious agencies to which he might be exposed. But, in addition, the continued passage along the bowels of masses of indigestible food must cause constantly renewed irritation to his delicate mucous membrane, and, if the same diet be persisted in, must lead in time to diarrhœa. When due to this cause, there are three periods at which the disease is most usually found to manifest itself.

If the child be brought up by hand, he may be subject to it from his very birth. In these cases the infant not only does not grow, but, as his fat gradually disappears, he seems even to become smaller and more puny. It is not uncommon for a mother to say, speaking of a child of two or three months old, who all his short life has been suffering from this complaint, "No food seems to do him any good; he is smaller than when he was born."

If the mother is able to nurse her child, he often goes on well for four or five months, but then being supplied with other and less digestible food, as an addition to the breast-milk—food which is often ill-selected, and consists, not unfrequently, of portions of the meals of his parents—he begins to waste, and the diarrhœa is set up.

The third period at which this disorder is apt to show itself is the time of weaning. It is at this time that the simple food on which he has hitherto principally subsisted being withdrawn, he is so exposed to danger from the mistaken kindness of his attendants, who, confusing substantial with nutritious food, supply him with articles of diet which they consider suitable to *his* needs, because they know them to be sufficient for their own. The length of time during which children amongst the poorer classes are suckled in this country also favours the result described. The infant is often kept at the breast long after there is any nourishment to be obtained from his mother's milk. The degree of weakness to which he is reduced by such a system enfeebles his digestive power, and prevents him even from assimilating such a diet as, were he in health, would afford him the nourishment he requires.

Even while at the breast, the infant is not exempt from danger. Hired nurses, in whom the breast-milk is not sufficient in quantity or quality for the child's support, will often feed him secretly with farinaceous or other food, in order that the deficiency may pass undetected. This is not an uncommon source of disease in very young infants. In these cases it is difficult to extort a confession from the nurse, but our suspicions are often verified by a microscopic examination of the stools, when starch granules will be found in large numbers.

Bad air, want of sunlight, and want of cleanliness, are also fruitful sources of this disease, especially when, as is usually the case, they are combined with the preceding. The crowding together of children in rooms, where they live and sleep in a close atmosphere, is a frequent cause of derangement of the stomach and bowels. In an institution with which the writer was for many years connected, founded for the temporary reception of single women with their offspring, it was noticed that when the occupants of the infants' sleeping nursery reached a certain number, one or two deaths were certain to occur from bowel complaints, and this in spite of all possible precautions in the way of ventilation, &c. It was only by making arrangements for distributing the number amongst several rooms that this mortality could be avoided.

Chilling of the surface is another common cause of diarrhœa. Owing to extreme sensitiveness to changes of temperature in early life, children are very subject to catarrhs of their mucous membranes, and it often happens that it is not the mucous membrane of the throat or lungs which suffers, but that of the stomach and bowels. An intestinal catarrh once set up, predisposes to a second attack. In this way, by a succession of slight chills, a child may pass from one attack of intestinal catarrh to another, and may eventually die from a derangement which a little care and suitable treatment at the beginning would have arrested without difficulty.

Infants who are "short-coated" in cold, damp weather, often owe the beginning of an obstinate diarrhœa to the same cause. This change, so dear to the heart of a mother, is often made recklessly, and without any care to supply the place of the clothing which is withdrawn. It is not, therefore, wonderful that the child should suffer from the unaccustomed exposure; for, if an infant, at an age when warmth is a pressing necessity, be suddenly deprived of the chief protection to its lower limbs and belly, the consequences may be expected to be serious.

Older children also are often very sensitive to changes of temperature, and chilling of the surface is in them, too, a frequent cause of persistent looseness of the bowels.

The diseases which lead especially to this disorder are measles, scarlatina, variola, typhoid fever, pneumonia, croup, bronchitis, angina, and pleurisy. MM. Rilliet and Barthez found that out of 140 cases of secondary chronic diarrhœa in children 37 had been preceded by measles, 27 by pneumonia, 17 by typhoid fever, variola, and scarlatina, respectively, and 29 by the other diseases which have been mentioned.

In some children the presence of the ascaris lumbricoides in the alimentary canal will give rise to diarrhœa which may continue for months, now better, now worse, and only be finally arrested by the expulsion of the worm. In these cases the diarrhœa is most troublesome at night, the bowel during the day being much less disturbed, and is accompanied by great straining, and often by prolapsus ani.

When arising from the causes which have been mentioned, chronic diarrhœa is the result merely of a functional disorder of the bowels. It is a derangement rather than a disease; but may become serious if not promptly taken in hand; indeed, in young and weakly subjects, it often proves fatal. There is, however, another form of the diarrhœa found in older children, which is of constitutional origin. Young persons, like their elders, who are the subjects of pulmonary disease, are apt to suffer from secondary ulcerations of the bowel, and the chronic diarrhœa which is thus excited hastens the fatal termination of the illness. This variety of chronic diarrhœa is rare in infants: it is most commonly found after the age of three years.

Morbid Anatomy.—Not unfrequently on opening the bowel after death we find absolutely nothing at all to account for the serious nature of the disease: the alimentary canal may have a perfectly sound appearance from one end to the other.

In other cases we find the mucous membrane of the large intestine studded with fine, dark-coloured points, giving the so-called "cut-beard appearance"—an appearance which is due to a ring of congestion round the openings of the little follicles.

In other cases, again, the mucous membrane of the large intestines may be inflamed. The inflammation, however, is seldom general; it is usually limited to the summits of the longitudinal folds into which the lining membrane of the bowel is thrown.

Lastly, the mucous membrane may be not only inflamed, but ulcerated. The ulcers are shallow, and are often difficult to detect except by looking sideways at the surface, for their bases are of the same colour as the parts around them. They may occupy either the summits of the longitudinal folds—when they are elongated and sinuous, or may be situated between the folds—when they are very small and circular. Mixed up with the ulcers we see solitary glands and follicles enlarged and elevated above the surface, looking like little transparent pearls. The base is often surrounded by a ring of congested vessels. This state of the follicle is the first step in the process of ulceration. After a time suppuration takes place, so that the contents of the follicle becomes purulent, and the follicle itself still further increase in size. Lastly, the purulent matter escapes; the roof dies, and, becoming detached at the edges, leaves a sharply-circumscribed roundish ulcer. The pearly appearance of enlarged follicles is often seen during life on the inside of the mouth dotting the mucous membrane of the cheek.

The mucous membrane, when much inflamed, is often exceedingly soft, and may be much thickened. M.

Bouchut, however, states that where the disease is very chronic, and there is great emaciation, the lining membrane becomes thin, and in some cases hardly seems to exist at all.

These changes are sometimes found to extend into the small intestine, which may be inflamed or ulcerated for a short distance above the ilio-cæcal valve; but in the large majority of cases the lesions are limited to the colon.

The mesenteric glands are occasionally swollen, and in cases of long standing may be caseous.

In children over three or four years of age a different kind of ulceration of the bowels is met with. This is of a scrofulous nature, and may or may not be associated with the presence of tubercle. It is not uncommon as a complication of pulmonary phthisis and abdominal tuberculosis; but, even where the grey granulation is present, the morbid changes which take place are chiefly due to degenerative processes, set up, perhaps, by the tubercle, but not in themselves strictly tubercular. The seat of the disease is the ilium, and the parts affected are Peyer's patches and the solitary follicles—particularly those in the neighbourhood of the ilio-cæcal valve. The follicles become enlarged by a proliferation within them of their corpuscular elements. Caseous degeneration then takes place; the cheesy matter softens and disappears; and a circumscribed ulcer is left, which, if the follicles are close together, as in Peyer's patches, coalesces with others in its neighbourhood. The ulceration thus formed extends itself by a like process of caseation and softening in the tissues swollen by corpuscular infiltration, and may far exceed the boundaries of the Peyer's patch. In this way circular or oval ulcers are left, with uneven jagged edges, red, soft, thick, and rather detached. Their size varies: when oval or elongated their greater diameter lies transversely. The floor of the ulcer is red or greyish, and is formed by different coats of the intestine, according to the depth to which the ulceration has extended. Sometimes it penetrates as deeply as the peritoneal covering of the bowel; but extravasation into the peritoneal cavity is rare, on account of the thickening of the tissue at the base of the ulcer and the adhesions which are formed with the parts around. In some cases a careful examination of the ulcerated surface shows the presence of miliary nodules in the tunica adventitia of the smaller vessels, especially the arteries, and also beneath the peritoneal coat at the opposite surface of the bowel. According to Rindfleish it is especially the lymphatics which undergo tuberculous degeneration, and the sheaths of the vessels are chosen by the tuberculous products because they contain the efferent lymphatics of the intestine. It is this which determines the extension transversely of the lesion, as the ulcer follows the course of the small arteries and veins.

This form of ulceration leads almost invariably to enlargement and caseation of the mesenteric glands, and it is not uncommon to find that all the symptoms set up by the intestinal lesion are attributed to the glandular swelling, This subject will be discussed in another chapter.

Diagnosis.—If the child is seen early before the establishment of actual diarrhœa the nature of the derangement can be readily inferred from the course and nature of the symptoms and the character of the stools. In most cases, unless questioned closely upon the matter, the mother will make no reference to the state of the bowels, or will merely say that they are regularly relieved. Sometimes the enormous quantity of the alvine discharge attracts her notice: but it is rare for information with regard to the state of the stools to be obtained without direct inquiry. In all cases, therefore, where a child, whatever its age, is becoming pale and thin, and is found to be losing strength, the condition of the bowels and the state of the dejections should receive careful attention. At this period of the derangement gradual loss of flesh, colour and strength may be the only symptoms complained of. The appetite is often good and the spirits of the child may seem little affected. Sometimes, indeed, the appetite is unusually keen, and the mother will declare that she cannot think what is the matter with the child, for in spite of all the food he takes he gets paler and thinner.

Tuberculosis is often suspected in these cases, and, indeed, the general appearance of the child and the vagueness of the symptoms are calculated at first to convey a false impression as to the nature of the complaint. Still, the absence of pyrexia is a valuable negative symptom in excluding the diathetic disease; and the character of the stools amply accounts for the faulty nutrition of the patient.

If the case be first seen after diarrhœa has become established, it is important to exclude, if possible, the presence of tuberculous or scrofulous ulceration of the bowels. To do so, we must consider the age of the child, the circumstances under which the purging commenced, and the existence of disease in other organs.

If the derangement date from a few days after birth, or from the time of weaning; or if the patient be an infant who has been injudiciously fed, insufficiently clothed, or neglected and exposed to privation, the case is in all probability one of simple intestinal catarrh. Moreover, the age of the child furnishes in itself a strong presumption in favour of this view, for during the first year, or even the first two years of life, chronic diarrhœa is almost invariably catarrhal. In any case, after an examination of the whole body, we should not neglect to take the child's temperature, by introducing the bulb of the thermometer, previously wetted, into the rectum. In simple chronic diarrhœa the temperature is, if anything, lower than in health, and does not become elevated in the evening. If then we find that the heat of the body is not increased, we have just grounds for believing the case to be an ordinary one of chronic functional derangement. We must, however, be on our guard against drawing wrong inferences from the presence of fever. Teething, or other sources of irritation, may cause a rise in the temperature. Therefore, we should in all cases satisfy ourselves as to the condition of the gums, remembering that children sometimes cut their teeth at four months old, and that chronic diarrhœa does not delay dentition. The temperature of a teething child is often as high in the morning as at night, and varies from time to time capriciously. If diarrhœa is present, however, the pyrexia rarely lasts longer than twenty-four hours.

Older children suffer also from chronic intestinal catarrh; but in them, as there is stronger probability that the disease may be due to ulceration of a scrofulous or tuberculous nature, the other organs should be examined with peculiar care for signs of disease. The chest should be searched for evidence of pulmonary mischief, and the abdomen for enlarged mesenteric glands and signs of intestinal ulceration. Tenderness on pressure of the belly in the right iliac fossa, with a certain amount of tension of the parietes in that situation, would lead us to suspect the existence of ulceration. The kind of stool most characteristic of this condition is that composed of dirty-brown fluid, with a deposit containing flaky matter, and small black clots of blood, with mucus and pus, the whole being intensely offensive.

When the child, after cessation of the diarrhœa and the beginning of convalescence, suddenly ceases to improve, the presence of some complication should be suspected. In such cases the lungs should always be examined for pneumonia.

Prognosis.—The prospects of the patient will vary according to the cause of the diarrhœa, the age of the child, and the intensity and obstinacy of the purging.

If there is pulmonary disease, with cheesy mesenteric glands, and especially if, in addition, signs of ulceration of the bowels can be detected, recovery can scarcely be hoped for.

In cases of simple chronic catarrh the prognosis is more serious in children under two years of age than in older children; but even in an infant, chronic diarrhœa is not difficult of cure so long as the attacks of purging are intermittent, however short the intermissions may be. When the looseness of the bowels becomes a confirmed derangement the chances of recovery are diminished. Still, even in these cases, if the infant be of good constitution, we may entertain hopes of a favourable issue. If there be hereditary taint, as syphilis; if the child be suffering from rickets in any but a mild form; or if he be much reduced in strength at the time when he first comes under notice, the prognosis is very serious.

When secondary to acute disease, the case is graver than when the derangement is primary and non-febrile from the first. The most favourable cases are those which are due unmistakably to error in feeding, or to neglect, provided treatment be begun before symptoms of exhaustion have set in. In such cases we may hope by careful treatment to arrest the purging, before any ulceration has been set up in the alimentary canal.

The form of stool which is of worst augury is that which has been described as characteristic of ulceration in the bowels. The thicker and more homogeneous the motions become, although they may at the same time remain intensely offensive, the more favourable is the prognosis.

The occurrence of any complication should give rise to very great anxiety. Measles especially is apt to cause a sudden and violent increase in the intensity of the diarrhœa; and, moreover, its own course is often rendered irregular by the presence of the intestinal disorder, so that retrocession of the eruption and other alarming symptoms may ensue. The prognosis is also rendered very unfavourable if the tongue become dry and rough; if thrush appear upon the inside of the mouth; or if dropsy occur.

Amongst the favourable signs may be included,—continuance of the natural process of dentition; the appearance of tears; and the occurrence of any eruption* (unconnected, of course, with any of the exanthema) upon the child's body, even although the diarrhœa may not at the time have undergone any visible improvement.

Prevention.—Diarrhœa may be prevented by attention to the diet and general management of the child. All indigestible food is calculated, in its passage through the bowels, to give rise to irritation, and therefore to cause an increased flow of watery fluid from the vessels of the intestines. It is unnecessary to repeat here the directions which have been already given for the feeding of young children, and the reader is referred to the section on the treatment of simple atrophy for full information upon this subject. It may, however, be remarked that the practice of giving to very young children sweet cakes, and articles of confectionery, between their regular meals, and as rewards for good behaviour, is one to be very strongly deprecated. Sweet cakes are especially to be avoided, as they are so apt to undergo fermentation in the alimentary canal.

As cold is so common a cause of diarrhœa in children great care should be taken to shield them from this source of danger. But they should not, therefore, be confined too strictly to the house. Fresh air is as important to them as simple nourishing food. Healthy infants should be taken out at certain periods of the day whenever the weather permits. It is not so much cold as *damp* air which is dangerous to infants, and even in damp air, unless it be actually raining, a short expedition is not hurtful to a robust child, provided sufficient precautions be taken. The child should be warmly dressed, should be carried briskly along, and should not be allowed to remain out too long at a time. If there is any wind his face should be protected with a woollen veil. As an additional defence, a flannel bandage should be worn round the body next to the skin. This is an article of clothing no infant or young child should be without. It should be looked upon as a necessary part of his dress. The band should be sufficiently wide to cover the whole belly from the hips to the waist, and long enough to go twice round the body. It should be secured by "safety" pins; and in fitting it care should be taken to wrap the bandage tightly round the hips, so that it may not slip up and leave the lower part of the belly exposed. The band is more elastic if cut diagonally from the piece of flannel.

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* Underwood.

Sudden changes of temperature are especially to be avoided, and a rapid change from cold to heat appears to be as prejudicial as a similar passage from heat to cold. It is, therefore, necessary to prevent an infant being taken too quickly to a hot fire after exposure to the cold of the outside air. The child should not be allowed to wait, clothed in his out-door dress, in a warm room, before taking his airing. He should be taken out directly he is dressed for the walk. While out, he should be kept in movement, and should not be allowed to remain motionless in a current of cold air. If able to walk, he should be placed from time to time upon his feet, and be allowed to trot along holding the hand of his nurse. If the weather is cold, damp, and gloomy, he should be brought back to the house after only a short stay in the open air. A pinched look about the face, with coldness and blueness of the extremities, are certain signs that he is no longer receiving benefit from his airing. If a perambulator be used, the child, on cold days, may rest his feet upon a caoutchouc hot water-bottle.

During dentition the rules here laid down must be especially observed, for it is at such times, when the teeth are pressing through the gum, that diarrhœa is so common. Many children are said always to cut their teeth with diarrhœa. Perhaps, however, dentition in these cases is not so entirely to blame as is commonly supposed. No doubt, during the cutting of the teeth, the bowels generally are in a state of irritability, for we know that at these periods the follicular apparatus of the intestines is undergoing considerable development. The bowels then are ripe for diarrhœa; there is increased sensitiveness to the ordinary exciting causes of purging; but without the presence of these exciting causes diarrhœa is by no means a necessary result of such a condition of the alimentary canal. We find that looseness of the bowels is a more common accompaniment of dentition in summer and autumn than in winter; that is, at a season when the changes of temperature are rapid and unexpected, and when therefore the child is particularly exposed to sudden chills; rather than at a time of the year when the temperature, though lower, is more uniformly low, and when precautions are more naturally taken against the cold. Moreover, when the early teeth appear the child is ceasing to depend for nourishment entirely upon his mother's milk. His digestive organs are, therefore, apt to be deranged by articles of diet unsuited to his age. Even if the diet be a suitable one for the infant when in health, it by no means follows that the same regimen will be found equally appropriate at a time when the febrile irritation set up by the advancing tooth has temporarily reduced his digestive power. His ordinary diet may then become indigestible, and therefore irritating to his bowels.

Treatment.—The marked influence exercised upon chronic diarrhœa in children by variations in the temperature and degree of moisture of the air indicates an important means of checking the disease.

The infant must be kept as nearly as possible in an equable temperature of from 60° to 65° Fahrenheit. Free ventilation must be sustained by an open fire, or in warm weather by a lamp placed in the fender; but all draughts of air should be carefully guarded against. Where practicable, two adjoining rooms, having a door of communication between them, should be chosen. The child may then inhabit them alternately, and during his absence the unoccupied apartment can be freely ventilated. Even where this convenience is unattainable, two rooms, although separated from one another by a passage, should be always made use of: the child can be taken from one to the other without danger if wrapped from head to foot in a blanket. At night, air should be admitted into the room as freely as is consistent with the avoidance of draughts: with this object, the door of the room may be left open, or in dry warm weather the window may be opened for a short distance at the top. In damp weather, however, or in seasons when the temperature falls notably at sunset, this must be prohibited. If possible, the infant with his nurse should be the only occupants of the bedroom, and no cooking of any kind should be allowed in the nursery.

The most scrupulous cleanliness must be observed. The nates should be carefully sponged and dried after each motion, and should then be dusted over with powdered lycopodium, or, if the skin is abraded, with equal parts of this and of powdered oxide of zinc; while the whole body should be bathed twice a day with warm water. All soiled napkins must be at once removed from the room, and the night-cot and bedding should be taken away every morning, and be freely exposed to the air.

If a flannel bandage have not been previously in use, it must be at once applied as directed above. This precaution should on no account be neglected. Flannel, which is a non-conductor, forms by far the most efficient protection to the belly against sudden changes of temperature. Chronic diarrhœa is, no doubt, frequently kept up by a succession of chills, just as a coryza or pulmonary catarrh may be prolonged almost indefinitely by the same means. By the use of this safeguard we at any rate ensure ourselves from having to deal with a *series* of catarrh. For the same reason the feet and legs should be covered with woollen stockings. It is well known that cold feet have a very bad effect on irritable stomach and bowels; and in children, otherwise healthy, often produce severe pain in the belly. In a child suffering from abdominal pains the feet should always be examined, and if cold, it is usually found that on warming them the manifestation of pain ceases.

The next thing is carefully to regulate the diet. In chronic diarrhœa children are often excessively ravenous, and the mothers and nurses, true to their principle of giving the most solid food to the weakest children, are in all probability filling him with everything that is most calculated by its indigestible properties to aggravate his abdominal derangement. "The child," they say, "will eat anything," and they give him "anything" accordingly. All this must be at once put a stop to, and the diet of the child must be so arranged that he will still be nourished, while the demands upon his digestive power are reduced to a minimum.

If the patient be an infant at the breast, who, besides his mother's milk, has been overfed with farinaceous food, or allowed to swallow unsuitable morsels from his parents' table, a strict limitation to the breast will often produce a surprisingly beneficial effect upon the derangement. If the infant has been fed artificially without judgment, the engagement of a good wet-nurse will often have a similarly favourable influence. If, however, this plan of treatment cannot be adopted, or if, as may happen, it is not found to agree, other means must be resorted to. Thus, for an infant under six months old, the milk must be greatly restricted in quantity; or if the child be much reduced in strength, may judiciously be excluded at first altogether from the diet. In most of these cases milk in any form appears to act as a positive irritant to the bowels, fermenting and turning acid directly it is swallowed. When this tendency to acid fermentation prevails it will be hopeless to attempt to arrest the derangement so long as the milk diet is persisted with. Our first care must therefore be to substitute for it a non-fermentable regimen, and our chief trust should be placed in fresh whey, weak veal or chicken broth, and barley-water. The latter, which on account of its consistence is very grateful to babies, may be mixed with an equal proportion of whey and of broth alternately, and given from a perfectly clean feeding-bottle. If the purging be severe, the mixture must be given cold, and in small quantities at a time. In such cases, instead of using the feeding-bottle, the food should be given with a teaspoon.

By the above means a certain variety can be introduced into the diet; and the successive meals should be so regulated that the quantity taken on each occasion, and the length of the intervals by which the meals are separated, may be properly proportioned to one another and to the state of the patient. The more copious the diarrhœa, the smaller should be the meals, and the more frequently they should be repeated; for any large quantity of liquid food taken at once would be directly absorbed from the stomach into the circulation, and, when the purging is severe, would, by lowering the density of the blood, be immediately followed by an increase in the flow from the bowels. When the stools are frequent and watery, liquids should never be given in larger quantities than a tablespoonful at a time, and in bad cases one teaspoonful will be found sufficient.

Beyond the age of six months the yolk of one egg unboiled may be added to the diet. The egg is best digested when beaten up with a few drops of brandy and a tablespoonful of cinnamon water. As with younger infants, the quantities to be given at one time must depend upon the strength of the child and the state of his bowels.

Farinaceous food, with the exception of barley-water, seldom agrees in these cases; but if the child be over twelve months old, and the purging not very severe, we may, if desired, make cautious trial of baked or boiled flour, giving one teaspoonful with four ounces of milk and water. One of the malted foods is, however, to be preferred to unguarded farinaceous matter, especially the form known as Mellin's Food. This is very useful, and can be given dissolved in whey, barley-water, or a mixture of both, or in thin veal broth.

As the child improves, milk should always be returned to, but at first should be given with a sparing hand, for fear it should disagree. A good scale of diet for a child of nine months old, who is beginning gradually to return to milk food, is the following,* consisting of five small meals in the twenty-four hours:—

1st meal.—One teaspoonful of Mellin's Food for Infants dissolved in four ounces of milk and water, equal parts.

2nd meal.—Four ounces of veal broth, of the strength of a pound of meat to the pint of broth.

3rd meal.—Four ounces of fresh whey, containing a dessertspoonful of cream.

4th meal.—The unboiled yolk of one egg—plain, or beaten up with a tablespoonful of cinnamon-water, a little white sugar, and ten drops of brandy.

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* See also Diets 14, 15, 16 and 17, Chap. XI.

5th meal.—Same as the first.

In this dietary the first and fifth meals contain a small quantity of milk. It is best to assist digestion by allowing only milk which has been previously peptonised (see page 46). If this be found to disagree, the Mellin's food may be dissolved in barley-water, alone or diluted with an equal quantity of weak veal broth, or weak veal broth alone may be given. In any case, the quantity of four ounces should not be exceeded, for it is wise, especially at the first, to be sparing rather than liberal in regulating the allowance of food. It is better that the child should be hungry than overloaded: and so long as the stools retain their pasty character it is evident that the food taken remains in great part undigested. In these cases, and indeed in all cases where a special diet is recommended for children, a dietary, as given above, should be written out by the medical attendant for the benefit of those to whose care the child is entrusted. Not only the kind of food, but the quantity to be given at each meal, and even the hour at which the meal is to be taken, should be duly set down, so that no excuse may be available for neglect or misapprehension.

Whatever be the diet adopted, our object is to keep up the nutrition of the body with the smallest amount of irritation to the alimentary canal; and the food, whatever it may be, which will produce this result, is the food best suited to the case. Without attention to this point, all treatment by drugs is useless, for a lump of indigestible food will neutralize the effect of the most powerful astringents. The successful adjustment of the diet—an adjustment in which the quality and quantity of food allowed for each meal are accurately adapted to the powers and requirements of the patient—is a matter which can be properly learned only by experience, and which often makes large demands upon the tact, the ingenuity, and the patience of the medical attendant. This experience every one should labour to acquire, for without it success can seldom be attained in the treatment of the chronic functional derangements of young children.

In the case of children between eighteen months and two years old the derangement, as has been said, often begins insidiously. The bowels are relieved once or oftener in the day, but can hardly be said to be relaxed. The stools consist of light-coloured, pasty matter, which in exceptional cases may even be formed. They are always large, and are usually offensive. In this form of the derangement milk must be strictly excluded from the diet, and the quantity of starchy matter taken must be considerably reduced. It is advisable in all these cases to allow only farinaceous food which is guarded with malt. Instead of ordinary bread, the child must take malted biscuits, such as those made by the Messrs. Hill and Sons, of Bishopsgate Street, or the malted loaf, as supplied by Mr. Spiking, of Dover Street. Mellin's food is useful, made thick with whey. If desired, it may be flavoured with cocoatina. For dinner the child may take meat jelly, strong veal or chicken broth, or pounded raw meat, made as directed on a later page (see page 102). Yolk of egg often agrees well, and may be given lightly boiled, or beaten up with a teaspoonful of brandy.

One of the disadvantages connected with this method of feeding is that after a time the child is apt to suffer from monotony of diet and absence of fresh food. The blood becomes deteriorated in quality, and symptoms of scurvy begin to appear. The gums get spongy, and the knees or other joints suddenly swell up and grow exquisitely tender and painful. On this account fresh vegetable food * should be always included in the diet.

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* If, on account of the season of the year, fresh vegetables are diffi-

Spanish onion, flower of broccoli, vegetable marrow, or young French beans, may be given. Each of these must be well boiled until thoroughly tender, and afterwards passed through a sieve. Every care should be taken to vary the diet as much as possible, as the patient soon tires of his food, and may lose his appetite in consequence. Finely-ground lentils, sold under the name of "Revalenta Arabica," will be found a useful resource, and are often well borne if prepared with a third part of finely pounded malt. It will be necessary to continue the diet for many months, for the inability to digest milk and starch often continues for some time after the child has regained his flesh and strength. When milk is returned to, it should be given peptonised, as already directed.

In the case of older children who share the ordinary meals of the household, it will be necessary also to make considerable restrictions in the amount of fermentable matter allowed. Potatoes, sweet biscuits, and farinaceous matters generally, sugar, jams, &c., should be excluded from their diet, and they should be fed upon bread and milk, freshly-made broths, with, at dinner-time, a little fresh meat and broccoli, or green vegetables. Puddings, as a rule, should be forbidden, but custard-pudding may be permitted. For drink they should take toast-water, plain water, or milk and water.

The abdomen should be protected by a broad flannel bandage, as already directed for infants. Care should be taken to keep the feet warm, and, unless the weather be fine and dry, the child should be confined to the house.

External applications are exceedingly useful in this disease, for the secretion of the skin is usually suppressed at an early period. The hot bath may be used at first every night, with all the precautions already enjoined

cult to obtain, or if the child refuse to take them, a teaspoonful of fresh lemon-juice may be given him with a little water at dinner-time. This rarely disagrees.

(see page 14), after which the whole body should be freely anointed with warm olive oil, and the child be well wrapped up in flannel. When the prostration becomes marked the mustard-bath may be ordered. In cases where ulceration of the bowel is suspected, and it is thought advisable to apply local counter-irritation, a poultice consisting of equal parts of flour of mustard and linseed-meal should be used. This should be applied at some distance from, and not directly over, the seat of disease—to the chest, and not immediately to the belly; and its effect should be carefully watched, that the irritation thus excited may be kept within due bounds. If the child is very weak, the mustard, after remaining on a few minutes, should be removed, and a hot poultice of linseed-meal should be applied in its place. When the tenderness of the abdomen is very great it is advisable to keep the whole belly constantly covered with a large hot linseed-meal poultice. This must be changed frequently, but with great care that the child be not chilled in the process.

The preceding directions embody the essential points in the treatment of chronic diarrhœa. It is upon the judicious arrangement of his food, the careful protection of his body from fresh chills, and the plentiful supply of pure air, that the recovery of the child depends. The question of drug-giving is one only of secondary importance. In every case, therefore, before any medicines are prescribed, the above-mentioned matters must be attended to. The medical attendant should, with his own hands, apply the flannel bandage tightly round the patient's hips and waist, laying the child down for the purpose, with legs stretched out, so that the flannel may be brought well below the projection of the hips, and thus be prevented from slipping upwards.

With regard to internal remedies:*—If the patient is seen at the first, before the diarrhœa has become established, and when there is nothing but pallor, languor, gradual loss of flesh, griping and tenesmus, with large, pale, sour-smelling stools, a small dose of powdered rhubarb, with carbonate of soda, should be ordered, and then, when the bowels are relieved, a mixture containing tinct. opii with bicarbonate of soda in some aromatic water :—

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* All the prescriptions given in this section are adapted to a child of twelve months old, unless otherwise stated.

℞. Tinct. opii, gtta j ;
Sodæ bicarbonatis, gr. ij ;
Tinct. zingiberis ♏j ;
Aq. chloroformi ad ℥j. M. Ft. haustus.
To be taken three times a day.

The opium at once renders the peristaltic action of the bowels more regular, and the stools become darker and less offensive in the course of a few days.

The mixture containing tinct. opii and castor oil, is also very useful if the tongue is furred :—

℞. Tinct. opii, gtta j ;
Ol. Ricini, ♏ij ;
Glycerini ;
Mucilag. acaciæ, āā ♏v ;
Aq. ad ℥j. M.
To be taken three times a day.

But it should not be used if the tongue is clean, and must not be continued longer than forty-eight hours if no benefit be found to result from its employment.

Alteratives are in these cases of little value, for it is no use attempting to stimulate the functions of the liver by cholagogues. The large white putty-like stools consist, in great part, of undigested food ; and we shall best succeed in restoring the digestive power by antacids and aromatics, as directed above, and, more than all, by the careful adaptation of the food, both in quantity and quality, to the enfeebled powers of the child. It is in these cases that milk is seldom well borne, except in very small doses well diluted with lime-water, and it is often necessary to replace this by other articles of diet, as already described.

Sometimes these patients are greatly benefited by the administration of extract of malt, directly after each meal. If the bowels are not relaxed, malt extract is usually well borne, but in some children it has an aperient action which is injurious. Pepsine is another useful digestive. Three to five grains given to a child of eighteen months or two years old, with a drop or two of dilute hydrochloric acid and one of laudanum, directly before each meal, will be found of service. The dose of pepsine should be always combined with a small quantity of laudanum, so that the passage of food along the bowel may be sufficiently delayed to give the digestive time to exert its influence.

Finkler's papain is a digestive of even greater value. It should be given in combination with an alkali, as in the following :—

℞. Papain (Finkler), gr. ss ;
Sodæ bicarb., gr. ij ;
Pulv. trochisi menth. pip., gr. iij ;
M. ft. pulv.
To be taken three times a day just before food.

When the purging sets in, if the stools are green, and slimy or watery, with a sour smell, it is best to begin with a dose of bismuth and chalk. To be of service the dose of bismuth must be a large one. The remedy is not absorbed into the circulation, and may be therefore given in large quantities to the youngest children without any danger.

℞. Bismuthi carb. gr. x.
Pulv. cretæ aromat., gr. ij.
M. ft. pulv.
To be taken every four hours.

If there is much tenesmus, an injection containing four or five drops of laudanum, with five grains of bicarbonate of potash, to half an ounce of thin warm starch, may be thrown up the bowel. Dr. Evanson strongly recommends the addition of the alkali, which, he says, greatly increases the efficacy of the injection.

So long as the stools remain sour-smelling, antacids should be persisted with. An aromatic should always be combined with the antacid. "This," says Dr. Underwood, "is of more importance than is usually apprehended. I have known a careful attention to this circumstance alone happily suppress complaints in the bowels, which had long continued obstinate, though, in other respects, properly treated." In these cases, too, an emetic is often of great service.

It is necessary to inspect the stools daily for signs of mucus or any increase in the looseness. Usually, in spite of all possible care, the motions will be found every now and then to be loose and slimy. When this occurs a powder containing two or three grains of powdered rhubarb and double the quantity of aromatic chalk powder should be given every night, and in the daytime the child may take the castor oil and opium mixture already recommended. By this means the state of the bowels will be greatly improved in the course of a few days.

If, when the tongue cleans, the diarrhœa continues, and the stools are found to consist of dirty-brown stinking water, astringents must be used.

The best of these, without any doubt, is nitrate of silver. One-eighth of a grain should be given with one drop of dilute nitric acid and one drop of laudanum in aqua chloroformi every four hours. This remedy is valuable in all forms of chronic intestinal catarrh in children, but is especially useful in cases where the stools are very frequent and watery, and contain variously coloured mucus and blood; or where the prostration is great, with aphthous ulceration of the mouth. In such cases it should be always resorted to.

The ordinary astringents seem of little service; and in many children gallic acid, dilute sulphuric acid, lead, hæmatoxylon, and other similar remedies may be given perseveringly without producing any impression upon the derangement. Bismuth, however, in large doses (gr. x—xv to a child of twelve months old every three or four hours) will often check the diarrhœa at once, especially if given with aromatic chalk powder, as already recommended; but the improvement is sometimes only temporary.

Injections of nitrate of silver are valuable in the later stages, particularly if there are any signs of ulceration of the large intestine. The bowel should be first cleared out with warm water, and then an enema, containing one grain of the nitrate to five ounces of cold water, should be administered. Trousseau recommends that in bad cases it should be repeated twice in the twenty-four hours. Astringent enemata must not, however, be continued too long. They should be suspended every two or three days in order to watch the effect, and in the interval enemata of simple starch may be used, as recommended by MM. Rilliet and Barthez.

The perchloride of mercury is a useful remedy in cases where very slimy motions are passed with much straining and pain, especially if lumps of coagulated mucus, compared by the attendants to "lumps of flesh," are found in the stools. Three to five drops of the pharmacopœia solution may be given in water every hour or two hours, sweetened with spirits of chloroform.

All this time the diet must be attended to, and the other precautions already recommended must be continued. External applications, as before described, must also be made use of, employing more and more decided counter-irritation as the weakness of the child increases, and his prostration becomes more marked.

Stimulants will also be required as the child grows weaker, and must be given pretty freely when the sinking of the fontanelle and the other symptons show that he is becoming exhausted. Five or ten drops of pale brandy, or double the quantity of dry pale sherry, may be given in a spoonful of the food three, four, six times a day, or even every hour, as required. Good beef gravy, free from fat, is also useful at these times.

Not seldom, in spite of all our efforts, the child goes on from bad to worse. The diarrhœa resists all treatment, and continues obstinate, whatever be the measures adopted. In these cases the treatment by raw meat becomes a valuable resource. All food must be stopped, and the child must be nourished in the following way. A piece of raw mutton or rump-steak, free from gristle or fat, is finely minced, and is pounded in a mortar till it is converted into a pulp, The pulp is then strained through a fine sieve or a piece of muslin, to remove the blood-vessels and cellular tissue. Of the meat so prepared a teaspoonful is given at regular intervals four times in the day, and every day the quantity administered is gradually increased, until half a pound is taken each day in divided doses. This diet usually causes the motions to have an intensely offensive smell; but this is of no consequence, and the parents should be warned of its liability to occur. The patients themselves often like the food, and take it eagerly. If, however, as may happen, they show any repugnance to it, the meat may be given in a small quantity of veal broth, may be diffused through jelly, or may be mixed with an equal quantity of cream, if the latter can be obtained perfectly fresh. As medicine, we must give at the same time the pepsine mixture, already recommended, with the addition of one drop of tinct. opii to each dose. There can be no doubt about the value of this remedy. Under its influence the stools become less frequent and less liquid, and although they remain for a time horribly fetid, yet they gradually assume more and more the character of healthy evacuations, while the other symptoms undergo a like amendment. For the first day or two the meat will be found in the motions almost unchanged, except for decomposition, the dejections consisting of colourless fibrine with a little cellular tissue and mucus; but by perseverance we find that it begins gradually to be digested, and less of it appears every day in the stools.

When from this or other treatment the diarrhœa has been arrested, and the stools have become more healthy-looking, a tonic should be given, and the one best adapted to continue the improvement is the solution of the pernitrate of iron, which has besides a beneficial influence upon the alimentary canal. It is best given with dilute nitric acid :—

℞. Liq. ferri pernitratis, ♏ijss ;
Acidi nitrici diluti, ♏ijss ;
Glycerini, ♏v ;
Aquam Anethi, ad ʒij. M. Ft. haustus.
To be taken every six hours.

Other tonics may afterwards be given, as the decoction of bark with syrup, the citrate of iron and quinine, cod-liver oil, &c. If the oil be given, its effects must be carefully watched. It is best to begin with a small dose, as ten drops in a teaspoonful of food three times in the day; but if there be any smell of the oil in the stools, even this small quantity must be diminished. The constipation, which usually succeeds to the diarrhœa, should not be lightly interfered with. If two or three days have passed without any action of the bowels, a very small dose—about twenty drops—of castor oil may be administered, and may be repeated, if necessary, after four or five hours.

As so much harm is often done in these cases of chronic diarrhœa by little indiscretions, it is of extreme importance that we should not allow improvement to make us relax in our attention or diminish our precautions. It is a good rule in all cases where the child is getting better to act as if he were getting worse, to redouble our vigilance rather than to relax in it; for at any time a chill or a fragment of indigestible food may undo all that has been done, and throw the child back into a state from which it has required perhaps weeks of unremitting care to deliver him.

After the cessation of the diarrhœa the child must not, however, be kept too low. As his digestive power increases, his diet should be improved in proportion. This is very important, as rickets is not an uncommon result of the impairment of nutrition produced by the disease, and is therefore favoured by anything which tends to prolong the weakly condition of the infant.

In patients of three or four years old and upwards chronic diarrhœa usually excites less anxiety than in younger children, and responds more readily to treatment. If the diet be regulated upon the plan previously laid down (see p. 96), and a flannel bandage be properly applied to the belly, recovery usually follows quickly enough. For medicines the child may take an alkaline mixture, containing two or three drops of laudanum, and every other night for a week, a powder containing four to six grains of powdered rhubarb with twice the quantity of aromatic chalk powder. Should the diarrhœa still persist, five drops of tincture of catechu in a teaspoonful of mucilage every hour, or a mixture containing gallic acid, dissolved in aromatic sulphuric acid, may be resorted to.

The lienteric diarrhœa previously described, in which the evacuations occur frequently after a meal, and consist of undigested food, requires a different kind of treatment. This variety of diarrhœa is not to be controlled by the ordinary astringents, and is very much increased by aperients, as castor oil. Opium will, however, sometimes check it temporarily, but for its permanent cure the best remedies are arsenic and tincture of nux vomica in small doses.

The following short cases will serve as illustrations of this form of diarrhœa, and of the treatment to which it is most readily amenable:—

Master R., aged five years, had been subject for twelve months to prolonged attacks of diarrhœa, during which the bowels acted four or six times in the day. The motions usually followed a meal, and sometimes so urgently that he was obliged to leave the table before the repast was concluded. The motions were said "to run from him," and to contain much slimy matter. There was no straining, but the stools were preceded by some griping pains in the belly. He was fretful and rather thirsty, but slept well at night. He was losing flesh rapidly, although his appetite was large. The child was ordered to take three drops of tincture of nux vomica in a draught of citrate of potash three times a day before meals. A few days afterwards he returned very much better. The bowels were acting three times a day, not after meals. His appetite was more easily satisfied, and he had ceased to waste. A change was then made in his medicine to one drop of liq. arsenici chlor. in a nitric acid mixture before each meal, and he was not seen again.

Elizabeth W., aged four years, had suffered for a long time from repeated attacks of diarrhœa, each of which lasted for many weeks together. The motions were said to follow immediately upon taking food, and to occur sometimes in the intervals between the meals, so that the bowels were frequently acted upon five or six times in the day. The stools were slimy, and were passed without straining or apparent discomfort. The child was irritable in temper, and was very restless at night. Her appetite was capricious, and she was very fanciful in her eating.

Her skin was exceedingly rough and dry. The tongue was clean, and over the surface were scattered light-red elevated papillæ. She was first seen on January 7th, and was ordered to take one drop of liq. arsenicalis in a mixture containing citrate of iron and ammonia, with bicarbonate of soda, three times a day. A warm bath was recommended every night, for the purpose of softening the skin and removing the dry epithelium scales.

On January 14th the girl seemed better in herself, although the bowels were in the same condition as before. She had taken the medicine regularly, but each meal was still followed by the accustomed stool, and the child was still losing flesh. A mixture was then ordered containing laudanum and tincture of nux vomica—two drops of each to be taken before every meal. Considerable improvement followed the change of medicine: the appetite became very good, and the bowels, although still relaxed after each meal, did not act in the intervals, so that the daily number of evacuations was much reduced. The skin, owing to the nightly warm bath, had become soft and supple. One drop of liq. arsenici chlor. was then given three times a day in a nitric acid mixture, and the cure was soon complete.

CHAPTER III.

CHRONIC VOMITING.

(CHRONIC GASTRIC CATARRH.)

CHRONIC VOMITING.—Frequency of slight attacks of gastric disturbance — Such attacks easily remedied — Chronic vomiting nonfebrile.

Symptoms.—Those of gradual interference with nutrition, ending in exhaustion—Spurious hydrocephalus.

Causes. Diagnosis.—From tubercular meningitis—Diagnosis of spurious hydrocephalus.

Treatment.—Attention to diet—Return to breast—Substitute for wet-nurse—Warmth—External applications—Baths — Medicines —Stimulants—Emetics—Rules for giving these—Treatment of spurious hydrocephalus.

SLIGHT attacks of vomiting, lasting for twenty-four hours, or even for several days, are not at all uncommon in infants even while at the breast. The matters ejected consist of the food, of stringy mucus, and of bile; at the same time there is some heat of skin, thirst, loaded tongue, and constipation or diarrhœa. These attacks, due to an acute catarrh of the stomach, always end favourably unless they are aggravated by much meddling. The only treatment required is an emetic of ipecacuanha wine to relieve the stomach, followed by a gentle purge, and by careful regulation of the diet. Sometimes it is necessary to forbid even the breast-milk for a time, and to restrict the infant to cold thin barley-water given with a teaspoon.

These attacks are of little consequence. The child may get a little flabby and pale, but when convalescent a week of ordinary feeding restores him to his former state of health. The catarrh may, however, pass into a subacute stage, which is much more serious, and the vomiting then becomes chronic and persistent. This condition is often a very dangerous one, and always produces great wasting and prostration.

Symptoms.—There is no fever. The child vomits at irregular intervals, throwing up the milk curdled and sour-smelling, and, at the first, tinged green or yellow from bile. The bile, however, soon disappears from the vomited matters, and clear fluid, like water, is ejected, alone or mixed with the food. On pressure of the epigastrium the child writhes as if in pain. The belly is full, often tympanitic, and gurgles when pressed upon. Eructations occur of fetid, sour gas, and the bowels are obstinately confined. An eruption of strophulus often covers the body and arms, and the complexion has often a sallow, half-jaundiced tint. The child gets thinner and paler, and is very fretful. The fontanelle becomes depressed. Some diarrhœa may at first alternate with the constipation, but after a few days the bowels become again confined, and the motions, when they occur, consist of round, hard lumps, very light-coloured, evacuated with great straining. The lumps may be covered with tough mucus. The tongue is coated with a thick layer of dirty-yellow fur: it is not very moist, and dull-red papillæ of medium size are seen peering through the fur, here and there, on the dorsum of the tongue. The breath smells sour. The lips are dry and red. A furrow passes down from each side of the nose to encircle the corner of the mouth, so that the lips seem to project. The mouth is clammy and parched, and the child takes the breast eagerly to relieve this parched feeling by the flow of milk, but rejects what he has swallowed very shortly afterwards.

After the child has remained in this state for a considerable time, often with occasional intervals of improvement for several months, the vomiting becomes more frequent. It occurs not only after taking food, but also in the intervals of feeding, and seems to be excited by the slightest movement, or by a touch, so that the mere act of wiping the mouth may bring on a fresh attack of retching. The milk is thrown up uncurdled. Emaciation then goes on rapidly. The skin is dry and harsh, and hangs loose and flaccid; the eyes get hollow; the nose sharpened; the cheeks sunken; and the belly retracted. He lies with the knees drawn up on to the abdomen, and, when they are straightened out, returns them as soon as possible to their former position. Occasionally he moves his legs uneasily, as if in pain. He is intensely fretful, breaking out into sudden cries, or, as he becomes weaker, into a low, pitiful wail, which is even more distressing to hear, and never seems to sleep, night nor day. The tongue is dry, and is still furred, so that it has a rough, granular appearance. In bad cases the whole body has an offensively sour smell. The smell proceeds not only from the breath, but is caused by acidity of all the secretions; the saliva, the perspiration, and the urine being all intensely acid. The cutaneous secretion is, however, seldom in excess; more usually the skin is inelastic and dry, and is in consequence rough and harsh to the touch, especially at the back of the arms and the belly. At length the child is reduced to a state of extreme emaciation. The surface is pale and cold, and there is often a peculiar earthy tint of the whole body; the hands and feet become more or less purple; and the temperature, as shown by a thermometer placed in the rectum, may sink as low as 97° Fahr. Vomiting occurs at the slightest movement. The child lies dozing, or in a state of semi-stupor, with eyes half closed; and the only sign of vitality is respiration. When thrush appears upon the inside of the cheeks and lips it is a sign that the end is approaching; and he gradually sinks and dies, the constipation persisting to the last.

Towards the end of the disease symptoms which have been described as "spurious hydrocephalus" are often noticed. Dr. Gooch, in his interesting paper on this disorder, says, "It is chiefly indicated by heaviness of head, and drowsiness; the age of the little patients whom I have seen in this state has been from a few months to two or three years; they have been rather small of their age, and of delicate health, or they have been exposed to debilitating causes. The physician finds the child lying on its nurse's lap, unable or unwilling to raise its head, half asleep, one moment opening its eyes, and the next closing them again with a remarkable expression of languor. The tongue is slightly white, the skin is not hot, at times the nurse remarks that it is colder than natural; in some cases there is at times a slight and transient flush: the bowels I have always seen already disturbed by purgatives, so that I can scarcely say what they are when left to themselves: thus the state I am describing is marked by heaviness of the head and drowsiness, without any signs of pain, great languor, and a total absence of all active febrile symptoms."

The symptoms thus described are not peculiar to chronic vomiting, although they are especially apt to occur with that disease. They may be found in all cases where great exhaustion is induced from whatever cause, and are therefore not uncommon in chronic diarrhœa. In all these cases the fontanelle is deeply depressed, showing deficiency in the amount of blood circulating through the brain; the pupils are often dilated and immovable, and there may be coma, with stertorous breathing. It must not, however, be concluded that cerebral symptoms occurring in a wasted feeble infant are invariably the consequence of sluggish circulation through the brain of impoverished blood. Parrot compares the condition to uræmia, and noticing the diminished secretion of urine observed when such cerebral symptoms are present, suggests a toxic origin for the phenomena. In some cases, actual structural alterations can be discovered by examination of the dead body. Thrombosis of the cerebral sinuses may take place, as described in the preceding chapter. Intracranial hæmorrhages are also sometimes found, but it must be confessed that the latter lesion cannot always be connected with symptoms observed during life. Still, from whatever cause they may proceed, there can be no doubt that the symptoms are of most unfavourable augury, and show the condition of the child to be perilous in the extreme.

In cases of recovery the vomiting becomes less frequent, and gradually ceases, although for some time it is liable to recur if much food be taken at once. The constipation, however, remains obstinate for some time after the cessation of the vomiting. The child then begins to regain flesh, and often becomes exceedingly fat.

Causes.—Most of the cases of this disorder which have come under my notice have been in infants of a few months old, and have usually resulted from premature weaning, the child being taken from the breast and fed upon farinaceous or other articles of diet which he is unable to digest. It is not an uncommon complaint in infants whose mothers having obtained the situation of wet-nurse leave their children in the care of ignorant and often careless attendants.

The crowding of children together in close nurseries, or amongst the poor the stifling atmosphere of the one room in which a whole family is often lodged, is another common cause of the disorder.

These causes have already been fully discussed under the head of chronic diarrhœa.

Severe operations upon the child, such as that for stone in the bladder, are often followed by an acid dyspepsia, which may lapse into obstinate vomiting; a chronic catarrh of the stomach and bowels being set up, which may lead to death after the more immediate effects of the operation have been recovered from. Any cause, in fact, which lowers the easily-depressed general strength will reduce also the digestive power, and thus predispose to this complaint.

Drugging with opiates by an unscrupulous nurse will sometimes keep up persistent vomiting in a newborn baby. Therefore, if we find the pupils to be contracted, and notice that the child is unnaturally stupid and apathetic, we should suspect such a cause for the indisposition, and advise very searching inquiry.

Diagnosis.—The diagnosis of chronic gastric catarrh presents little difficulty. The frequent vomiting of offensive sour fluid, the emaciated condition of the child, and the long course of the complaint, leave little room for uncertainty. If the combination of obstinate vomiting with constipation, or the occurrence of cerebral symptoms, should give rise to suspicions of acute tuberculosis with secondary meningitis, the two diseases are readily distinguished. The temperature of the body depressed instead of being elevated; the sunken fontanelle; the rapid, feeble, but regular pulse; the state of the belly, swollen rather than retracted—all tend to exclude the latter disease.

Treatment.—Our first care must be to attend to the proper feeding of the child. In cases where the vomiting has followed premature weaning, the gastric derangement is evidently due to the change of diet. Inquiry should, therefore, at once be made into the kind of food which has been substituted for the mother's milk, and it will usually be found that farinaceous matters have been given largely in excess of the child's requirements or powers of digestion. In these cases the infant's food should be limited to peptonised cow's milk (see page 46), or to equal parts of new milk and barley-water. The quantity allowed must be small at the first, but it can be gradually increased, according to the readiness with which it is retained.

If the case be not a severe one, and no fermenting process be going on in the stomach, such a change of diet, combined with other measures to be afterwards described, will usually succeed in restoring the digestive organs to a healthy condition. But when there is a sour smell from the breath or body of the child such treatment will be of little service. The sour smell is the result of fermentation of food, and denotes an intensely acid condition of the stomach. In such a case it is indispensable to improvement that all fermentable matters be excluded from the diet. Even cow's milk itself, however diluted and alkalinized, can seldom be borne, as it usually is vomited sour and curdled immediately after being swallowed. Still, woman's milk is sometimes well digested, and if the infant be young, a return to the breast may be followed by a rapid arrest of the vomiting—the stomach, which has rejected all other food, at once recognizing the change of diet. Suckling must, however, be conducted with very great care. In all cases the child should take the breast at regular intervals, and should not be allowed to suck too long at one time, the amount of nourishment he is permitted to swallow being regulated on each occasion by the degree of irritability of the stomach and by the result which has followed the previous meal. If this has been rejected, the quantity allowed to be drawn at the next suckling must be diminished. When infants are very much reduced by constant vomiting the mere act of sucking appears often to excite retching. In such cases the nurse's milk can be given with a teaspoon.

When a return to the breast is impracticable, or is not followed by the expected improvement—and, indeed, in many cases human milk seems to agree as little as the milk of the cow—the diet should consist of whey with cream,* or of equal parts of weak veal broth * and thin barley-water. In all cases of severe and obstinate vomiting a stoppage of the ordinary food and a resort to one of these mixtures, as a substitute for the milk diet, will almost certainly be followed by immediate relief. They should be given *cold;* and, if the vomiting be severe, a teaspoonful only should be allowed at one time. This may be repeated at intervals of ten minutes. It is only after the vomiting has been arrested that the child can be allowed to suck the food from a feeding-bottle. If a couple of days have passed by without any return of the sickness, a little milk may be added to the diet. This must be given at first with caution, and must be peptonised or diluted with an equal proportion of barley-water, and be aromatized by the addition of one or two teaspoonfuls of cinnamon or carraway water. The kind of milk which agrees best in these cases is that before referred to (see page 45), under the name of "strippings." It is rich in cream, but comparatively poor in curd, and is therefore much more digestible than the ordinary cow's milk. If this agrees, the quantity can be increased, and in the course of a few days, by gradual steps, the child may return to the ordinary diet of health.

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* Fresh cream, one tablespoonful; whey, two tablespoonfuls; water, two tablespoonfuls. If the cream obtainable cannot be depended upon, a good substitute is the cremor hordeatus of Loeflund.

If the infant be much weakened, either by the length of his illness or the violence of the attack, "white wine whey" † should be at once resorted to. The whey must be given perfectly cold, and at first in small quantities. If the vomiting be frequent, no more than one teaspoonful can be allowed at one time. This method of feeding almost always agrees well, and the vomiting ceases very quickly. As the irritability of the stomach subsides the child may be allowed to take more and more of the whey, and after a few days may suck it from his feeding-bottle like an ordinary food. In this way the infant will take large quantities of stimulant with very great advantage. When twenty-four hours have passed by without any return of the vomiting, a tablespoonful of fresh cream may be shaken up with the bottleful of whey. If this be well digested, a return may be made to the ordinary diet by cautious steps, as already described.

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* The veal broth should be of the strength of half a pound of veal to the pint of broth.

† To make "white wine whey":—Put a breakfast-cupful of new milk into a saucepan on the fire. When it boils add a wineglassful of sound sherry; then boil again for a couple of minutes and strain off the curd. Afterwards replace in saucepan and simmer, skimming off the curd as it rises until the whey is clear. The whey may be sweetened with white sugar. The proportion of milk used may be varied according to the strength of stimulant required.

Infants at the breast sometimes become the subjects of a chronic gastric catarrh, so that the milk, immediately it is swallowed, is ejected sour and curdled; and if the vomiting continue, as it is apt to do unless proper measures be taken to arrest it, the nutrition of the child may be seriously impaired. If this derangement occur in a very young infant it is often erroneously concluded that the breast-milk is unsuited to the baby, and he is ordered to be weaned. Such a step is, however, seldom if ever necessary. In mild cases the administration of an alkali with a stomachic such as nux vomica will often arrest vomiting, without any change in the diet being required.

In very severe cases it will be prudent to forbid the breast for four-and-twenty hours, or even a little longer, until the vomiting ceases, but suckling may be afterwards resumed without danger. In the interval the child can be fed with whey and barley-water,* mixed in equal proportions, or with the whey and cream, as recommended above.

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* Barley-water is very useful in all these cases, for it is not only perfectly innocent, as a diet, but it supplies the necessary consistence to the food. A child will often refuse a liquid if it be made too thin. A food to be taken readily by babies must possess a suitable consistence.

The following is an illustration of this class of cases:— A B, a fine child, aged eight weeks, was stated to have been persistently sick after food ever since its birth. He had been suckled for the first seven weeks, but had invariably vomited the milk shortly after taking the breast. A week before the child came under my notice he had been weaned, and fed on condensed milk, diluted in the proportion of a teaspoonful to half a tumbler of water. This, however, he vomited, as he had done the breast-milk. He was stated to smell sour occasionally, and when he vomited, the ejected matters were discharged with considerable force, but without any retching. The bowels were loose, and the motions consisted principally of undigested milk. The child looked pretty well, but had a slight yellowish tint of the skin. He was losing flesh fast.

In this case the cause of the indigestion was evidently catarrh of the stomach, which dated from the time of birth. It was explained to the mother that her milk was not unsuited to the child, but that it disagreed temporarily, as did all other food, on account of the condition of the digestive organs. She was recommended to begin nursing again immediately; but, as her milk had partially disappeared, the breast was limited to two meals a day, and a supplementary diet composed of one teaspoonful of Mellin's food for infants, dissolved in one part of "strippings" and two of water, was ordered, every two hours. At the same time one-quarter of a drop of the tincture of nux vomica was given with a few grains of carbonate of soda, three times a day, in cinnamon-water. Under this treatment the vomiting soon ceased, the gastric derangement quickly subsided, and, as the secretion of breast-milk returned in considerable quantity, the child after a short time required little food in addition to that furnished by his mother. In this instance the derangement was easily overcome; but sometimes the vomiting is not so readily arrested. If no milk could have been borne, the Mellin's food might have been dissolved in barley-water, or in equal parts of that and fresh whey.

In all cases, then, of obstinate vomiting from a chronic gastric catarrh the question of diet is determined upon the simple principle of giving the digestive organs as much rest as possible. Food of the simplest character is given in small quantities, and if any fermentative process is going on in the stomach, it is at once arrested by stopping the supply of fermentable material.

Great attention must be paid to the clothing of the infant. He must be warmly dressed, with a flannel bandage round the belly, and, while the vomiting is urgent, should be kept in a room comfortably warm, but not too hot. Fresh air should be freely admitted, and at night, if there is no fire, a lamp should be placed in the fender. Great cleanliness should be maintained; clothes and linen moistened with the vomited matters should not be allowed to remain in contact with the child's body, but should be at once removed from the room. The whole body should be well sponged with warm water twice a day.

It is extremely important to keep the feet warm. Thick woollen socks should be supplied, and the feet should be occasionally well rubbed with the hand alone, or with a liniment composed of equal parts of compound soap liniment and olive oil. If they still continue cold they may be placed in a mustard foot-bath, with water sufficient to cover the lower extremities as high as the knees. Warm applications to the epigastrium and belly are of great service. Hot linseed-meal poultices, made more stimulating by the addition of a little mustard, should be applied to the pit of the stomach, and at times frictions may be used over the belly with the same embrocation as has been directed for the feet. If there is great prostration the child may be placed for a few minutes in a bath of the temperature of 95° Fahr., or the mustard-bath may be used. All these applications are useful, not only as counter-irritants, but also as tending to promote the free action of the skin. With the same object inunctions of olive oil may be made use of, the oil, well warmed, being smeared over the whole body once, twice, or oftener in the day, as already recommended (see Introduction). By this means also a considerable quantity of nourishment can be introduced into the system; it is a measure which should never be neglected when the vomiting is obstinate.

With regard to the medicines to be employed:—If the child is seen early before the strength is much reduced, and we notice a sour smell from the breath with a thickly furred tongue, an emetic should be at once administered. A teaspoonful of ipecacuanha wine is the best form in which this can be given.

Afterwards, when the stomach has been emptied of the acrid secretions and mucus, measures must be taken to quiet the gastric irritability and prevent any further formation of acid. By far the most valuable sedative in these cases is arsenic given in small doses.

For a child of three months old half a drop of Fowler's solution of arsenic may be given three times a day, with two grains of bicarbonate of soda in a teaspoonful of aromatic water. At the same time the bowels, if confined, should be relieved by an enema of barley-water, containing half an ounce of castor oil, and they may be kept in regular action by one or two drops of a solution of podophyllin in alcohol (a grain to the drachm), or by suppositories of Castile soap placed in the rectum.

In cases where arsenic does not succeed, one-sixth of a grain of calomel may be laid on the tongue every four hours, or half a drop of tincture of nux vomica may be given with an alkali. Still, the actual drug to be employed is quite a secondary consideration. In bad cases our trust should be placed, not in the pharmacopœia, but in energetic measures for stopping the fermenting process and assisting the escape of acid from the system. The obstinate vomiting is most surely checked by giving the stomach as much rest as is consistent with supporting nutrition. If the diet have been regulated as described, and if proper precautions have been taken for restoring the action of the skin, and ensuring a proper relief from the bowels, the patient will, in all probability, recover, whatever be the drug made use of.

When the child is much prostrated, as shown by the depression of the fontanelle, stimulants are always indicated. The white wine whey is here of great service, and if the infant be young should be always resorted to. For older children pale brandy may be used, given in doses of fifteen or twenty drops in a teaspoonful of the food or of plain water. When the prostration is great, the stimulant may be repeated every hour, or even oftener.

If the child is at all weak, great caution must be exercised in the use of emetics. An emetic is only required when there is reason to suspect the presence of acrid secretions in the stomach. If, however, the tongue is clean, and there is no sour smell from the breath, an emetic is no longer indicated, and its employment would only increase the prostration. Vomiting is sometimes kept up by debility of the stomach, and this would be only increased by the exhibition of nauseating remedies. When the prostration, as shown by the condition of the fontanelle, is great, caution in the use of emetics is especially needful, as fatal syncope might follow their employment; and if the fontanelle is deeply depressed, they should on no account be made use of.

When we are called to a child who presents the symptoms described as spurious hydrocephalus, or to one who has been reduced by a long continuance of this derangement to a dangerous degree of prostration, our first care should be to endeavour to restore the circulation to the extremities by placing the feet as high as the knees in hot mustard and water. This is best done as the child lies on a pillow placed on the nurse's lap. If the weakness be extreme, the whole body may be immersed for three or four minutes in a mustard-bath as high as the neck. It is of the first importance in such cases to restore the proper action of the skin, for it is by this means chiefly that we hope to eliminate the acid from the system. On being removed from the bath the infant should be carefully dried; a hot linseed-meal poultice should then be applied to the belly, and the child, well wrapped in flannel, be returned to his cot. The warmth of the surface must be kept up by hot bottles placed by his sides; and the feet and legs should be well rubbed at intervals with the hand alone, or with a liniment composed of equal parts of compound soap liniment and olive oil. If the child can bear the motion, frictions with the same embrocation may be used to the whole body; but in cases where the weakness is extreme and the vomiting obstinate, violent retchings may be excited by the slightest movement, so that the frictions would have to be discontinued. In such cases the feet and legs should be wrapped in hot flannels on which some flour of mustard has been sprinkled, and the most perfect quiet must be enforced. A napkin must be placed under the chin to receive all matters ejected from the stomach; and when moistened, the cloth must be immediately removed and a clean one supplied in its place. At the same time the food should be limited strictly to white wine whey, or to barley-water mixed with an equal proportion of weak veal broth, given cold with a teaspoon. If the latter be used, five drops of pale brandy may be added to the spoonful of food as often as seems desirable. By such measures, aided by the administration of liquor arsenicalis in one drop, or half-drop doses, given with an alkali, success can often be attained even in the very worst cases of this derangement, but in young babies especial care must be taken to promote the circulation and encourage the free action of the skin. The existence of cold feet alone would be a sufficient obstacle to the success of any treatment whatever.

After the vomiting has ceased and the more urgent symptoms have been overcome, iron wine may be given with half a drop or a drop of tincture of nux vomica to the dose; and as the child improves, he must be taken out of doors whenever the weather permits, for a free supply of fresh air is a most important agent in the treatment of this as of all the other chronic diseases of children.

CHAPTER IV.

RICKETS.

RICKETS.—Preliminary symptoms those of general mal-nutrition—Symptoms of beginning—Deformities of bones—Enlargement of ends of bones—Softening—Thickening of flat bones—Mechanical deformities—Bones of head and face—Distinction between the rickety and hydrocephalic skull—Cranio-tabes—Dentition—Spine—Thorax—Deformities of long bones and of pelvis—Arrest of growth of bones—Articulations—Relaxation of ligaments—Other symptoms — Enlargement of liver and spleen—Intellect—Complications — Catarrh and bronchitis — Diarrhœa — Laryngismus stridulus—Convulsions—Chronic hydrocephalus—Death from intensity of general disease.

Pathology.—Rickets a general disease—Anatomical characters of bony changes—Analysis of rickety bone—Emphysema and collapse—Alterations in lymphatic glands—In spleen—liver—In other organs – Urine.

Diagnosis. *Prognosis.*—Importance of complications.

Causes.—Rickets not a diathetic disease—Bad feeding and hygiene—Connection between rickets and syphilis.

Prevention. *Treatment.*—Diet—Dry bracing air—Attention to digestive organs—Tonics—Value of mechanical supports—Treatment of complications—Catarrh — Diarrhœa — Bronchitis—Convulsions and laryngismus stridulus—Scurvy.

RICKETS, although one of the most preventable of children's diseases, is yet one of the most common. It begins insidiously, presenting at first merely the ordinary symptoms of defective assimilation, and attention is often not attracted to it until the characteristic changes occur in the bones which place the existence of the complaint beyond a doubt.

Many of the symptoms described under the head of simple atrophy constitute a preliminary stage of rickets.

They are not, as has been said, characteristics of this special disorder, but merely mark the process of gradual reduction of strength, and of interference with the assimilative functions, which must take place to a certain degree before the disease can be established. This preliminary stage is not, however, always present. Rickets is the result of mal-nutrition: any disease, therefore, which seriously interferes with the assimilative power, and causes sufficient impairment of the general strength, may be followed directly by the disorder under consideration, without any intervening stage. Reduce the strength to a given point, and rickets begins. Prolong this state of debility sufficiently, and the characteristic changes resulting from the disease manifest themselves. Any cause, therefore, which will reduce the strength to this point lays the foundation of rickets.

Symptoms.—The beginning of the disease is indicated by the occurrence of two very special symptoms :—

One of these is a curiously profuse sweating about the head, neck, and upper part of the chest. The perspiration is extreme : it will be seen standing in large drops upon the forehead, and often runs down the face. There is unusual moisture of the parts both day and night ; but if the child falls asleep, the quantity is instantly increased, and at night is sufficient to make the pillow wet. When awake, the slightest exertion or elevation of the temperature excites it at once. At the same time, the superficial veins of the forehead are large and full, the jugular veins are distended, and the carotid arteries may sometimes be felt strongly pulsating. The irritation excited by this constant perspiration will often give rise to a crop of miliaria about the temples, the upper part of the forehead close to the roots of the hair, and at the back of the neck. While the head and neck are thus bathed in perspiration the abdomen and lower limbs are merely moist, sometimes quite dry.

Another characteristic symptom is the dislike of the child to warm coverings at night. In the coldest weather he will kick off the bedclothes, or throw his naked legs outside the counterpane. The mother often notices this as one of the earliest symptoms, and will say that she has been obliged to wrap her child up in flannel to prevent his catching cold, as he will not remain covered by the bedclothes.

These two symptoms occur early and precede any sign of deformity of bone. In some children the beginning of morbid change in the osseous structures is indicated by tenderness; but in an uncomplicated case of rickets tenderness is never a marked symptom. It is true that when the disease is pronounced the patient is often unwilling to be danced about; but this disinclination to play is not necessarily the consequence of tenderness: at any rate it is seen in children who show no sign of distress at being handled. The dislike of violent movement is apparently due to the hurry of breathing it induces, for when their ribs are softened an increased demand for air is difficult to satisfy. Marked tenderness to the touch in rickets is usually a sign that the case is becoming complicated with scurvy.

The special symptoms are accompanied by all the other phenomena which preceded the beginning of the disease. The bowels remain confined, or are more or less capricious, a day or two of relaxation being followed by an equal period of constipation. More often, however, there are three or four evacuations in the course of the twenty-four hours, accompanied by considerable straining. The stools consist of whitish, curdy-looking matter, mixed with mucus, and are extremely offensive. The food taken seems to pass almost unchanged through the alimentary canal, being, no doubt, forced too rapidly along from abnormal exaltation of the peristaltic action of the bowels, so that sufficient time is not allowed for digestion. A certain amount of abdominal discomfort appears to be common in these cases, for the child may often be noticed to turn round in his cot on to his face, and will sometimes fall asleep resting upon his arms and knees, with his head buried in the pillow. The urine becomes more abundant, and deposits a calcareous sediment, or abounds in phosphates. There is usually some thirst; but the appetite is often voracious, so that the child very shortly after a meal will show a disposition to eat again. This is what we constantly meet with in cases of dyspepsia in the adult, where the peristaltic action of the intestines is unnaturally brisk. The child soon loses his power of walking, and sits, or lies about. He becomes dull and languid, and neglects his playthings. There is usually some emaciation; but if the symptoms are not severe at the first, he may be plump in appearance, although his flesh feels soft and flabby. In the daytime he is drowsy, but at night is restless, turning his head uneasily from side to side on the pillow.

The symptoms proper to rickets very seldom appear before the fourth month, and not commonly before the seventh or eighth. From my own experience I should say that the disease manifests itself most frequently between the seventh and eighteenth months, less frequently between the eighteenth month and the end of the second year, and rarely after the end of the second year. Still, we may find it beginning at a later period; and Sir William Jenner mentions the case of a girl, aged nine years, who had then only just begun to suffer.

At the time when general tenderness is first complained of the deformities of the bones usually attract notice. In the first place, the articular ends of the bones enlarge at the point of junction of the bone with its epiphysis. Both ends may suffer, but the change is necessarily more evident in the extremity which is superficial than in that which is more deeply placed. The ribs at their sternal ends are usually the first to be affected; next the bones at the wrists; and, as a rule, the enlargement is greater in the bones of the upper limbs than in those of the lower. The flat bones—the bones of the skull, the scapula, and the pelvis—become thickened; and all the bones become softened. It is this softening of the bones which, owing to mechanical causes, leads to the distortions so characteristic of the disease.

In a well-marked case of rickets we find all these changes; but very commonly many of them are absent. Even when present they do not always occur to an equal degree; in some cases the softening of the bones is more marked than their enlargement; in others, the enlargement is out of proportion to the softening. M. Guérin has stated—he has even laid it down as an absolute rule —that the deformities of the bones begin from below upwards, that the tibiæ become affected before the thigh bones, the thigh bones before the pelvis, and so on to the arms and head. This, however, is not correct. In some cases we certainly find the legs and thighs bowed earlier than the other parts, but it is in children who have walked, or can still walk; and in them the weight of the body determines the deformities of the lower limbs before the pressure upon the other bones has been sufficient to make them crooked. Besides, if a very heavy child be put on his legs at too early an age the tibiæ may bend a little, although there is no reason to suspect the child of being the subject of rickets.

The changes produced by the disease in the various bones are as follows:—

Bones of the head and face.—The skull is larger than it ought to be, and is of a peculiar shape. Its antero-posterior diameter is increased; the fontanelle remains open—often widely open—long after the end of the second year, the ordinary period of its closing: the thickening of the bones is most marked at the centres of the parietal bones, the bosses of the temporal bones, and at the edges of the bones outside the sutures, so that the situation of the sutures is indicated by deep furrows; the vertex is flattened, and the sutures are expanded or remain open. The forehead is high, square, and projecting, and is out of proportion to the face. This disproportion is exaggerated by the arrest of growth of the bones of the face, particularly of the bones of the upper jaw and the malar bones; therefore, while the forehead is larger, the face is smaller than natural. The projection of the forehead is due partly to thickening of the frontal bone, partly to expansion of the frontal and ethmoidal sinuses, and partly to enlargement of the brain. The shape of the lower jaw is peculiar. The normal curve has disappeared. Anteriorly the bone is flattened, but laterally, at the situation of the eye-teeth, it bends abruptly backwards at a sharp angle. This change is due, according to Fleischmann, to the imperfect growth of the middle portion of the jaw.

It is important to distinguish between the rickety enlargement of the skull and the expansion which takes place in hydrocephalus. In hydrocephalus there is greater disproportion between the skull and the face; the enlargement is more globular and regular, the antero-posterior diameter not being greater than the lateral; the bones of the skull do not give to the finger the sensation of being thickened; the fontanelle is more open, and if the accumulation of fluid be great, the bones at the sutures are more widely separated; the sutures themselves are not bounded by a ridge of thickened bone. The fontanelle in hydrocephalus is often, although not always, elevated; in rickets it is depressed, partly on account of the debility, partly on account of thickening of the bones which forms its boundaries. In rickets we find other well-marked symptoms showing the nature of the complaint. The two diseases are, however, occasionally combined. A moderate excess of fluid in the skull is not uncommon in rickets.

In such cases the configuration of the head and body generally is that of rickets, while the fontanelle is large and elevated, and the sutures, if there be much fluid, are open and fluctuating.

A curious condition of the skull, first detected by Elsässer, and known as *cranio-tabes*, may be present. On using gentle pressure with the tips of the fingers over the posterior surface of the head spots can sometimes be detected where the bone is thinned. The bone at these spots is elastic, feels like cartridge paper, and presents a concavity or depression, which varies in size according to the extent of the thinning. The usual size of these depressions varies from a linseed to a bean; but one whose size does not exceed a line in diameter can be detected by the practised finger.

These local losses of substance are confined to the occipital bone, of which any part may be affected except the protuberances. The frontal and parietal bones are, on the contrary, greatly thickened, often to double their natural depth.

Cranio-tabes is a common symptom of the disease. According to Jacoby, it may be found, if searched for, in forty per cent. of cases of rickets. It occurs early, preceding even the beading of the ribs, and may be present in a child of three months old.

The progress of dentition is arrested. If the disease make its appearance before any of the teeth are cut, their evolution may be almost indefinitely postponed. If some teeth have already appeared, the further progress of dentition is interrupted. This influence over the teeth is peculiar to rickets. In no other disease, in which general nutrition is affected, do we find any interference with the natural cause of dentition. In a child greatly wasted by chronic diarrhœa, or improper food, the development of the teeth does not seem to be hindered by causes which exercise so powerful an influence upon his general health;

and in tuberculosis and congenital syphilis the teeth are usually cut early.

Teeth which have already appeared speedily become black, decay, and drop early from their sockets. This is due to insufficient development of the dental enamel. It is not at all uncommon to see a rickety child of eighteen months or two years old with very few teeth as yet in his head, and those few black and carious.

In some rare cases, however, we find dentition unaffected, and even particularly forward, although the other symptoms of rickets are well marked. Thus Herbert K. cut his first tooth when five months old, and at the age of one year and nine months dentition was completed. He could not stand until his seventeenth month, and when a year and a half old could not walk without assistance. It was only just before cutting his last tooth that he was able to walk alone. When seen he was aged two years and nine months, a pale and rather weakly-looking boy; wrists large; tibiæ bowed; the teeth, however, were perfect and particularly sound.

The spine is bent; and the curvature is in proportion to the degree of muscular weakness, so that if there be much deformity it is a sign that this weakness is great. The direction of the curve varies according to whether the child can or cannot walk. If the child cannot walk, the cervical anterior curve is increased, and there is a posterior curve reaching from the first dorsal to the last lumber vertebræ. This is an exaggeration of the ordinary curve which exists when a child sits unsupported on the arm of his nurse. If the muscular debility is very great the curvature may be so pronounced as to be mistaken for angular curvature. It is, however, readily distinguished by holding the child up, supporting him with the hands under the arms: the weight of the body will then usually straighten the spine at once, particularly if gentle pressure is at the same time made on the projecting part.

If the child is able to walk the dorsal spine is curved backwards, the lumbar forward.

As a consequence of the cervical curve, and the accompanying weakness of the muscles, the head is no longer efficiently supported; it therefore falls back, and the peculiarity of the attitude thus assumed as the child sits up in his cot is very characteristic of the disease.

Lateral curvatures are occasionally seen, but they are far less common than the antero-posterior. Their direction is determined by the position assumed by the child. If he is carried constantly on the left arm there is lateral curvature, with convexity to the left; if on the right arm, the convexity is to the right.

The thorax is curiously deformed. Flattened behind, projecting sharply in front, it presents an appearance which Glisson compares to the prow of a ship, and which forms the condition commonly known as "pigeon-breasted." The ribs, as they leave the spine, are directed at first almost horizontally outwards, then bend sharply at an acute angle at the junction of the dorsal and lateral regions, and from that point pass forwards and inwards to unite with their cartilages. The cartilages curve outwards before turning in to their articulations with the sternum, so that the breast-bone is forced forwards, and the antero-posterior diameter of the chest is unnaturally increased. The lateral diameter is greatest opposite the acute angle formed by the ribs; least, at the points of junction of the ribs with their cartilages. This curving inwards of the ribs, and outwards of the cartilages, forms a groove on the antero-lateral face of the chest, which reaches from the ninth or tenth rib below, to the third, second, or even first rib above; and the groove is deepest just outside the nodules formed by the enlarged ends of the ribs. The groove varies on the two sides in length and in depth, for the liver and the heart support to a certain extent the ribs under which they lie. Thus the groove reaches downwards to a less distance on the right side than on the left, on account of the liver; and at the level of the fourth and fifth ribs it is shallower on the left side than the right, on account of the heart. The enlargement of the ends of the ribs gives a peculiar appearance to the surface of the chest; a line of nodules is seen, on the inner side of the groove, looking like a row of large beads under the skin. Below the sixth rib the chest widens, as the walls are forced outwards by the underlying liver, stomach, and spleen.

If we strip a rickety child and watch his breathing we see that in inspiration there is sinking in of the chest walls. The lateral depressions deepen; the sternum moves forwards; the abdomen expands; and a deep horizontal groove furrows the surface, dividing the chest from the belly, and marking the upper borders of the abdominal viscera. This recession of the chest walls shows the mechanism by which the deformity is produced. In the healthy subject when the diaphragm contracts, and the ribs are elevated in the act of inspiration, air rushes in through the glottis to expand the lungs, and to enable them to follow and remain in contact with the expanding chest walls. The atmospheric pressure is, therefore, overcome by the power of the osseous and muscular walls, aided by the pressure of the inspired air. In the rickety child, however, one of these agents is comparatively powerless. The softened ribs can afford little assistance to the air within the chest in resisting the pressure outside: they therefore sink in at their least supported parts, and produce the lateral furrows which have been described, while at the same time the sternum is carried forwards in proportion to the recession of the ribs.

Rokitansky held that chest deformity was due to want of power in the inspiratory muscles. Sir W. Jenner, however, has shown that the points of insertion of the muscles of respiration do not tally with the point of recession of the chest walls; and that the horizontal depression at the base of the chest corresponds, not to the points of attachment of the diaphragm, but to the upper borders of the liver, stomach, and spleen. These organs support the parietes, and prevent any sinking in under the pressure of the air. A similar cause produces an apparent bulging of the præcordial region during inspiration, for the heart supports the ribs behind which it lies, and prevents their receding to the same extent as the walls around.

The *clavicle* is distorted. There are two great curves; the principal one, forwards and rather upwards, is situated just outside the points of attachment of the sterno-mastoid and pectoral muscles. The second, backwards, is about half an inch from the scapular articulation.

The *humerus* is sometimes curved just where the deltoid muscle is inserted.

The *radius* and *ulna* are curved outwards, and also twisted.

These deformities are ascribed by most authors to muscular action, aided by the weight of the limb. Sir W. Jenner, however, excludes altogether the first-mentioned cause from any share in the production of these distortions. They are due, he says, to the habit practised by all rickety children, owing to their deficiency in muscular power, of supporting the body, while sitting, upon the open hands placed upon the bed or floor. The weight of the trunk is therefore, in a great measure, thrown upon the arms, and we see in consequence the deformities of the clavicle, the humerus, and the bones of the forearm, which have been described. The curvature of the humerus is also aided by the weight of the forearm and hand when the limb is raised by the action of the deltoid. The weight of the arm on the humeral end of the clavicle—the sternal end being supported by its muscles and ligaments—will also assist in producing the disfigurement of the collar-bone.

The *scapula* is very much thickened, and is said occasionally to be so deformed as to interfere with free motion of the shoulder-joint.

The *pelvis* varies greatly in shape, but is more often triangular than oval. Pressure may be brought to bear upon it in many different directions; thus it is pressed upon from above by the weight of the spine and the contents of the abdomen; from below by the heads of the thigh bones. The exact direction in which these compressing forces will act varies, firstly, according to the position of the child—lying, sitting, standing, or walking; and secondly, according to the age at which the disease comes on, and therefore according to the degree of ossification of the bones, for the cartileges are less yielding than the bones themselves. The distortion of the pelvis thus produced is often very remarkable. In a child of four and a half years old,* in whom lithotomy was performed by Sir Henry Thompson, at University College Hospital, the outlet of the pelvis was so contracted as barely to allow a stone, measuring $1\frac{1}{8}$ in. in length, $\frac{7}{8}$ in. in breadth, and $\frac{5}{8}$ in. in thickness, to pass through in its long axis.

The child died shortly after the operation from peritonitis, and on examination of the pelvis the brim was found to be exceedingly contracted. Its shape was obliquely caudate: the sacral promontory was distant $\frac{1}{8}$ in. from the left pubic ramus, $\frac{5}{8}$ in. from the pubic ramus of the right side, and $\frac{7}{8}$ in. from the symphysis of the pubes.

Besides the softening of the bones there is, however, another cause which tends to keep the cavity of the pelvis narrow and contracted, as is explained afterwards.

The *femur* is curved forwards if the child cannot walk.

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* An account of this case will be found in the *Medical Times and Gazette* for December 5, 1863.

If he can walk it is curved, forwards and outwards, being an exaggeration of the natural curve. Sometimes the head of the femur is seen bent at an acute or an obtuse angle to the shaft.

The *tibia*, before the child walks, is curved outwards, and the knees are then seen, as the child is held upright, to be widely separated from one another. After the child walks the weight of the body determines the bending. In these cases the distortion is seen principally at the lower third, and the curve is very abrupt, seeming to project over the foot; or the bend may be outwards, projecting over the outer ankle.

In these cases, also, the deformity can be explained otherwise than by the influence of muscular action. While the child sits in his mother's lap the weight of the legs and feet, pulling upon the lower end of the femur, produces the forward curvature of that bone. As the child sits cross-legged on the floor or bed the pressure on the external malleolus causes the normal curve of the tibia to be exaggerated.

The lower limbs are not, however, deformed in every case of rickets. If the child be unable to walk at the time when the changes in the bones begin, the lower limbs may escape distortion altogether. In such cases the muscles are excessively flabby, and the limbs, feeble and small, look too short for the body; but the bones themselves are straight. The upper limbs seldom share this freedom from deformity; but, owing to the child's habit of supporting himself, as he sits, with his hands placed upon the bed or floor before him, usually present the characteristic disfigurements which have been described.

The changes in the bones may take place to any degree. Some may be more marked, others less, according to the severity of the disease, the age of the child, and the time at which treatment is commenced. If the premonitory symptoms have been very mild, tenderness may be altogether absent, and the affection of the bones be limited—at any rate, at first—to beading of the ribs, enlargement of the wrists and ankles, postponement of dentition, and abnormal openness of the fontanelle. The child, if able to walk, is still pretty strong on his legs; he is lively, often plump, and does not appear to suffer much from the disease under which he is labouring. If treatment be at once had recourse to nutrition is restored, growth and development begin again, and health quickly returns. On the other hand, if the general symptoms which precede the attack have been very severe, *i.e.*, if the debility resulting from the deficient nutrition is very great, the tenderness of the bones is a well-marked symptom, the softening usually precedes, and is out of proportion to, the enlargement of the ends of the bones, and all the distortions which have been described are the result.

Again, the older the child when rickets first appears, the less likely is he to be affected early by softening of the bones; while, if the child be very young, the bones usually soften very quickly. This, however, is perhaps merely a consequence of what has just been stated, for the younger the child the more likely is his system to be profoundly affected by mal-nutrition, and therefore the more severe will be the consequences of that mal-nutrition.

Besides the softening of the bones, and the deformities which result from it, there is another effect of the disease which is not less remarkable. This effect is the arrest of growth of the bones. Growth is arrested not only while the disease is in progress, but even after apparent restoration to health. In a rickety skeleton all the bones are found to be stunted in growth, and this, combined with the bending of the lower limbs, which must necessarily detract from the height of the individual, is the cause of the short stature of persons who, when young, have been subject to this disease. The arrest of growth affects some bones more than others, being principally noticeable in the bones of the face, of the lower limbs, and of the pelvis. As it affects the pelvis the want of growth is very important from its influence upon child-bearing in after life. In the child the size of the pelvis and lower limbs is small in proportion to the rest of the body; in the adult female it has so increased as to be relatively larger than the other parts of the bony framework. If then the growth and development of the pelvis are arrested, its brim and outlet do not undergo the usual expansion, but remain small and contracted, retaining the characters of the infantile pelvis. The obstacle to the passage of the fœtal head, under such circumstances, becomes extreme, especially if conjoined with deformities produced by softened bone, and usually requires craniotomy or embryotomy before the child can be extracted. This condition of the pelvis may also interfere with operations upon the child, as in the case of lithotomy already referred to. According to Mr. Shaw, there is a correspondence between the degree to which the pelvis suffers from this arrest of growth and development, and the degree to which the lower limbs suffer from the same causes; we can, therefore, by observing the amount of stunting of the lower limbs, make some estimate of the extent to which the pelvis is likely to be modified in size and capacity.

The *articulations.*—As the ends of the long bones are enlarged the joints into which these bones enter must necessarily be enlarged also. They have therefore a knotted, bulbous look, an appearance which is aggravated by the atrophy of the muscles of the limb. In addition to this the ligaments which hold the bones together are relaxed: the joints are therefore loose and unsteady, and can be moved freely in directions which in a healthy state would be impossible. This looseness and mobility of the joints forms alone a great impediment to walking, even when the bones themselves are healthy; and in fact the relaxation of the ligaments does not always bear a due proportion to the osseous changes. It is often an early symptom; and we frequently see it carried to a high degree in cases where the disease in the bones is as yet comparatively trifling. In these cases, if we hold the child upright, so that the weight of the body rests upon the feet, we see that each lower limb forms an obtuse angle at the knee; the knees touch; the legs are directed outwards; and the foot is more or less everted, from relaxation of the ligaments of the ankle. In children in whom the disease appears at, or after, the end of the second year, this weakness in the joints is a very prominent symptom, and is often found where the limbs are perfectly straight and well formed.

All the joints in the body are sharers in this ligamentous weakness, for it is not confined to the articulations of the limbs. The fibrous bands which connect the vertebræ with each other and with the sacrum, the sacrum with the pelvis, are alike affected; and it is a conjunction of all these various lesions, combined with the softening of the bones, and the weakness of the muscles, which produces the inability to walk, and the difficulty of holding the body upright, which are so characteristic of the disease.

The general symptoms continue while these changes are going on. There is no fever, but perspiration is profuse; and the tenderness increases in proportion to the softening of the bones. The appetite may remain ravenous, but more often it diminishes, and the child shows a disgust for food, or only exhibits a craving for beer, and the more tasty articles of diet. Sickness frequently occurs at this time, for attacks of gastric derangement often complicate the disease, and aggravate it. In these cases there is a sour smell from the breath; the vomited matters words with the readiness exhibited by healthy children of ordinary cleverness.

Apart from all the physical changes produced by the disease, the behaviour of a rickety child is very characteristic, and is of itself almost sufficient to warrant a diagnosis. The quiet, the repose about him, strike the observer at once. Such a child, if able to support himself, will sit for hours, his legs stretched out straight before him on the floor, perfectly contented if only allowed to remain unnoticed. All that he wants is to be let alone. A healthy child delights in movement: a rickety child is only happy when at rest; his greatest pleasure consists in inaction. To look at him we are irresistibly reminded of the other term of life, for he appears to have anticipated at least one consequence of the weight of years, and to have combined the patient endurance of old age with the face and figure of a child.

Complications.—The state of extreme debility to which a child suffering from advanced rickets is reduced naturally favours the occurrence of secondary diseases in general; and it is usually to one of these that death is to be directly attributed, although, in some cases, the intensity of the general disease may be of itself sufficient to carry off the patient. Measles, whooping-cough, and scarlatina are very liable to occur, and to prove fatal; but there are certain other diseases which are especially predisposed to by rickets, viz.:—

Catarrh and bronchitis.
Diarrhœa.
Laryngismus stridulus.
Tetany and convulsions.
Chronic hydrocephalus.
Scurvy.

To *catarrh* and *bronchitis* are due a very large proportion of the deaths in this disease.

Bronchitis is an extremely fatal disease at all ages. The mucus which is thrown into the tubes impedes the entrance of air; but unless air can enter freely into the vesicular structure of the lung mucus cannot be expelled. In coughing to expel the mucus the lung must be filled with air to the utmost; the contained air is then prevented from escaping by closure of the glottis, and at the same time pressure is brought to bear upon the lungs by the muscles of expiration. The glottis is then suddenly opened, and the air is driven out, carrying with it the mucus which obstructed the tubes. The forced respiration seen in persons suffering from bronchitis is merely the effort made to draw in the air past the obstructing mucus. A second impediment to the entrance of air into the lung is found also in the healthy child. It arises from the natural flexibility of the lower part of the thoracic parietes which yield to a certain extent in inspiration before the pressure of the external air. In advanced rickets, however, this natural flexibility is greatly increased by the abnormal softening of the ribs, so that even when the lungs are healthy each inspiration is only effected by a distinct laborious effort. Now add bronchitis to this condition, and the impediment is extreme. Air cannot enter deeply into the lungs; mucus cannot be expelled; the air, however, in the lungs can be, and is expelled; there is, consequently, collapse, and the child dies—not properly speaking from the collapse, but from that which caused the collapse, viz., the inability of the inspired air to pass the obstructing mucus.

The extent to which the ribs are softened, and the amount of their recession in inspiration, are therefore of extreme importance as regards the prognosis of bronchitis when it occurs in rickety children.

Diarrhœa.—Rickety children are especially liable to attacks of purging. This may be accounted for partly by their extreme sensitiveness to changes of temperature;

and partly by the unhealthy condition of the alimentary canal, which always precedes and accompanies the disease, and which a very slight additional irritation would easily aggravate into diarrhœa. These attacks are exceedingly dangerous. We know that even healthy children, seized with profuse purging, rapidly lose flesh, and soon become exhausted. A few hours are sufficient, if the drain is severe, to cause a marked change in their appearance; their features quickly lose the roundness of youth, and assume instead the pinched, drawn characters of age. Rickety children, already enfeebled, are still less able to withstand the depressing effects of the disorder, and fall victims to it all the more readily in proportion to the degree to which their strength has been previously reduced.

Laryngismus stridulus, tetany and *convulsions* are not uncommon complications of rickets. An abnormal irritability of the nervous system appears to be a peculiarity of the rickety constitution. In ordinary cases of defective nutrition no such nervous irritability is observed, nor is a convulsive tendency originated by long-continued weakness. In rickets, however, the frequency of convulsions and laryngismus stridulus is undeniable. The latter derangement appears to be almost invariably associated with rickets as its cause; while in the case of general convulsions nearly half the children thus affected are found to be rickety.*

Some authors attribute the convulsive tendency to cranio-tabes. Lederer, out of ninety-six cases of laryngismus, found cranio-tabes in ninety-two. Jacoby has only seen one case of laryngismus stridulus unassociated with it. Vogel reports a case in which spasm of the glottis could be directly produced by pressure with the finger upon the softened spots. Hence it has been suggested that the spasmodic symptoms, which often come on at night, are the direct result of pressure conveyed to the brain as the child's head lies upon the pillow. Whatever may be the value of the explanation, the connection between laryngismus and rickets is exceedingly important as regards the treatment of these attacks. Most of the children in whom this conclusive tendency is marked have carpo-pedal contractions.

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* Out of fifty cases of laryngismus noted by Dr. Gee, forty-eight were rickety, and of these nineteen had general convulsions; out of 102 children, in whom general convulsions occurred, forty-six were rickety.—St. Bartholomew's Hospital Reports, vol. iii., 1867.

As dentition is backward in all these cases the laryngismus and the convulsions are frequently attributed to teething. The teeth, however, are quite innocent of any share in the production of these complications. They are backward as a consequence of the arrest of growth of bone, which is one of the characteristics of the disease. When the teeth do appear they are often cut with remarkable ease, and whereas the child had been formerly subject to convulsions, with or without apparent cause, the beginning of dentition is accompanied by no such phenomena; the removal of the rickety condition, as shown by the eruption of the teeth, being coincident with the disappearance of the spasmodic tendency.

The proneness to convulsions of the subjects of rickets must be always kept in mind, as by it we may sometimes explain the occurrence of eclampsia during the progress of various acute diseases. Thus, in whooping-cough a convulsive attack may be an event of the utmost gravity, as it may arise from cerebral embolism or announce the beginning of a serious inflammatory complication. In a rickety child, however, a nervous seizure in the course of whooping-cough may be induced by gastric derangement or some unimportant form of reflex irritation. If, then, in such a case we find well-marked signs of rickets, and notice after the fit that the expression of the patient shows little additional distress, and that there are no signs of lung complication, we may speak hopefully of his chances of recovery.

The primary cause of the convulsive tendency in rickets appears to be the imperfectly nourished state of the central nervous system, the brain and spinal cord necessarily sharing in the mal-nutrition which affects all the organs of the body. Often—probably in most cases—as nutrition is restored, the convulsive tendency subsides, leaving the child free from any form of neurosis. It is said, however, that this perfect freedom from after ill-consequences should not be relied upon too confidently. Some observers profess to see a connection between convulsions in early childhood and epilepsy in later life, and hold that the damage suffered by the brain during the rachitic period may be something more than a merely temporary injury. Thus, Dr. Gowers found that 10 per cent. of a given number of epileptics had had convulsions in infancy. Dr. J. A. Coutts, who has devoted much attention to this subject, would place the percentage from his own observations as high as 17. As infantile convulsions are especially apt to occur in rickety children, it is assumed that in these cases the epilepsy was a natural expression of the cerebral mal-nutrition found in rickets, and was therefore a direct consequence of that disease. But evidence furnished by statistics such as these is by no means conclusive. So many children suffer from rickets in a more or less pronounced form that any disease which could be named, or even any accidental injury, might by such reasoning be ascribed to the after effects of mal-nutrition in infancy. Evidence of a more trustworthy character than this is required before such a conclusion can be accepted as the true one.

Chronic hydrocephalus occasionally complicates the disease between the ages of eight and eighteen months. The fluid may be in the lateral ventricles, in the arachnoid sac, or in both. It often appears to be a merely mechanical effusion, the serosity being thrown out to fill up the space left when the cranial cavity becomes enlarged without any corresponding increase in the size of the brain. In these cases the convolutions are perfectly natural, and show no signs of pressure.

On account of the altered shape of the skull, hydrocephalus is often suspected where it does not really exist. The differences between the ordinary rickety head, and the skull expanded by fluid in its cavity, have already been pointed out. (See page 127.)

Scurvy is an occasional and important complication of rickets. The impoverishment of the blood to which the scorbutic symptoms are due may be dependent upon the same conditions which produced the primary disease, for scurvy and rickets may be both consequences of bad feeding and unhealthy surroundings. But while the latter is an outcome of general mal-nutrition, the former is the result of the absence from the blood of some special constituent. If this be supplied the child remains free from scurvy, however imperfect may be the nutrition of his system generally. When scurvy occurs, the disease appears in children who have been fed largely upon condensed milk and tinned foods. So long as the child is taking fresh cow's milk, he can never become scorbutic.*

Scurvy, when seen in the child, presents peculiar characters. The gums are not always affected. The principal symptoms are dependent upon sub-periosteal extravasation of blood. This extravasation usually occurs at the lower parts of the thighs and around the knee joints. Sometimes, also, the ends of the long bones become separated from the shaft. As a consequence there is extreme tenderness of the limbs, which at once strikes the observer as something quite beyond the usual tenderness of a rickety child. The limb swells at the site of the lesion, and is excessively tender. The child seems to suffer from constant pain, for he lies moaning in his cot, and cannot bear the slightest touch upon the swollen part. The latter is seen to be enlarged and sometimes œdematous. It may occupy the whole of the thigh or leg, or may be more circumscribed. The upper limbs are comparatively rarely affected. In addition to the swellings, petechiæ and bruise-like patches may be present, and sometimes unhealthy-looking sores are noticed on the skin. If separation of epiphyses takes place, the child, instead of keeping his limbs flexed, as at first, allows them to lie stretched out as if paralyzed. When this stage is reached, the pain and tenderness have usually greatly diminished. In exceptional cases the gums are spongy, but if the child be suffering from marked rickets, the gums are rarely affected to any great extent.

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* The statement in the text refers only to perfectly fresh cow's milk, which has undergone no manipulation in the nursery. I have seen well-marked symptoms of scurvy in a child of twelve months old, who was being brought up on "artificial human milk," with an occasional meal of gravy or beef-tea and bread-crumb.

Usually, certain general symptoms accompany the development of the local phenomena. The temperature rises to 101° or 102° in the evening, and the child sweats profusely. His complexion is excessively pale with a sallow tint, and his debility is extreme. The urine may contain albumen, and is sometimes tinged with blood.

The swellings first noticed sometimes disappear, to be followed by secondary swellings in other parts; and sometimes the symptoms pass off completely for a time, to return after a period of months.

When under appropriate treatment recovery takes place, it is complete. The local thickening which persists after the swelling has subsided gradually disappears, and even the separated epiphyses become again united with the shaft of the bone.

The conjunction of scurvy and rickets has been described by Fürst and others under the name of "acute rickets." The scorbutic nature of the complication has, however, been amply demonstrated by Drs. Cheadle and T. Barlow.

Besides the complications which have been mentioned, acute tuberculosis may occur in rickety children. This, however, is not a special complication of the disease, and is comparatively rare.

When death results from the intensity of the general disease, without the occurrence of any of these complications, the child becomes weaker and weaker; he loses all power of supporting himself, and can hardly move. The difficulty of respiration, owing to the softened state of his ribs, absorbs all his attention. The face gets livid, or leaden-coloured; the perspirations are extreme; the tenderness is so great that he cannot bear to be touched; the softening of the bones, and the consequent deformities, continue, although sometimes the bones seem to get brittle, and fractures may occur unless the child be moved with very great care. The appetite becomes completely lost; the body generally is much wasted, although the belly remains full and distended; and at last the child dies exhausted or asphyxiated.

If the disease terminate favourably, the symptoms gradually subside, and finally disappear. The tenderness becomes less marked; the bones cease to soften; the child appears more lively, and takes an interest in what passes around him. As the softening of the ribs diminishes, his respiration grows less laborious, and he will then begin to amuse himself with his toys. The appetite improves, and gets less capricious; the bowels are more regular, and the stools healthier-looking. The wasting ceases; the child begins to gain flesh, while the belly decreases in size, and becomes less prominent. The head-sweats are less noticed, and his sleep at night is more tranquil, although for a long time he will continue to throw off the bed-clothes at night unless restrained. Dentition is resumed, and goes on rapidly and easily. The deformities of the bones gradually diminish; the bones get very much straighter than would be expected from their former distortion, become exceedingly thick and strong, and the enlargement of the ends of the long bones becomes very remarkably reduced. The muscles also begin to be more developed, and increase rapidly in size. The increase in length of the bones, however, is not rapid, and the child remains more or less stunted, seldom when full grown reaching the average height.

In cases of recovery from advanced rickets we sometimes find that at the very time when the deformity of the chest is becoming obviously less the legs of the child begin to bend, although up to that period they had been straight. This seeming contradiction is apparently due to the fact that as nutrition improves and the disease subsides, muscular power increases. The child then begins to make more use of his legs. As soon as his strength allows he begins to get upon his feet, to stand and to walk. Consequently, his bones, as yet hardly consolidated, bend under the weight of his body.

The rapidity with which dentition proceeds during recovery is sometimes very striking, and is well illustrated by the following case. George P. at the age of two years had but twelve teeth, and could not stand. The chest was much deformed, the ends of the long bones were enlarged, and the legs were very thin and flabby. Treatment was begun on November 29. On January 24 of the following year, the boy could walk across the room steadying himself by the different articles of furniture, and by May 16 could walk well and firmly without any assistance. The teeth appeared as follows:—By April 7, he had cut the two upper canines, and by May 16, the two lower canines; by May 30, three back molars had appeared, and on the following day, June 1, the last remaining tooth pierced the gum. The treatment consisted in careful regulation of his diet; in the administration of alkalies with drop doses of tinct. opii, to improve the condition of his digestive organs; and afterwards, when the motions were perfectly healthy, in iron wine with half-drachm doses of cod-liver oil.

Pathology.—Rickets is a general disease, and affects very widely the tissues of the body. Its influence is most manifest in the bones, which are always implicated, but we find, in addition, changes in the brain, liver, lymphatic glands, spleen, muscles, and often in every organ in the body.

Rickets affects the bones in three different ways.

It interferes with their growth, not only temporarily, but permanently; for children who have been thus affected never, as Mr. Shaw has pointed out, grow into average-sized adults.

It interferes with their development, delaying the process of ossification, and rendering the calcareous deposit irregular and incomplete. There is great proliferation of the cartilages at the end of the bones, and of the periosteum; but here a pause takes place, and the further step in the process, the actual deposition of earthy salts, is very slowly carried on.

But besides its influence over the growth and development of bone, rickets produces equally serious changes in bone already completely ossified. The previously hard bone becomes softened; it may be bent with ease, and can be cut with a knife, like a carrot. The softening is not due, as was at one time supposed, to a removal of lime-salts previously deposited. It is not that hard tissue becomes soft, but that new soft tissue is slow to harden. In healthy growth of a long bone new osseous tissue is being constantly added to the surface, while a corresponding absorption takes place from the interior. In rickets, however, although the proliferation of the periosteum is extreme, this new matter does not undergo the usual ossification. The natural enlargement of the medullary canal continues, however, as in health. But as the loss of bone from within is not compensated for by the normal formation of new osseous matter at the circumference, the proportion of bony tissue is constantly diminishing, while that of new soft matter proliferated from the periosteum is constantly on the increase.

Many theories have been devised to account for the disease, and the structural peculiarities which arise from it; but none of these can be considered satisfactory. The proliferation of the cartilages and the periosteum has been attributed to inflammatory action. The delay in the deposition of earthy salts has been explained, by supposing them to be held in solution by free acids, chiefly lactic, existing in the blood of the patient, and generated by fermentation of food in the digestive organs. All this, however, is mere hypothesis. The inflammatory theory is corroborated neither by the anatomical characters nor the clinical history of the disorder; and with regard to the formation of acid, rickets is not always preceded by attacks of acid dyspepsia, nor is the increase of lactic acid or of phosphate of lime in the urine by any means a constant feature of the complaint. Besides, it is not only that the process of ossification is retarded; it is also perverted. Calcareous matter is found deposited in abnormal situations; indeed, the process has been compared by Sir William Jenner to the petrifaction we see occasionally taking place in enchondromata.

Morbid Anatomy.—The enlargement of the ends of the long bones is a real hypertrophy. Great preparations are made for the process of ossification. The cartilage cells enlarge and subdivide, not only in the immediate neighbourhood of the calcareous deposit, but also at a considerable distance from it. Hence the proliferating zone, instead of forming a narrow reddish-grey strip between the cartilage and the bone, such as is seen in natural ossification, appears as a broad grey band which may reach from a quarter to half an inch in width. A similar exaggeration of the normal condition is seen in the shafts of the long bones and in the flat bones. Here the proliferating layer of the periosteum is also unnaturally thick. It forms broad flat uniform elevations on the surface of the bone, and these in the case of the cranial bones are sharply circumscribed. The newly-formed tissue is bright red from excessive vascularity.

While every preparation is thus made for the reception of the calcareous deposit and the formation of osseous tissue, the actual conversion of the new material into bone takes place very slowly and imperfectly. The advancing bone, instead of penetrating in a regular line into the cartilage, developing medullary spaces in the normal manner, strikes up at different points, leaving the cartilage at other points still uncalcified, and these may remain untouched by the earthy impregnation, forming specks of cartilage completely surrounded by bone. The line of medullary spaces also shows the same irregularity. We find them not only in their normal situation just below the margin of calcification, but also penetrating into the proliferating cartilage, far in advance of the line of earthy deposit. These spaces are filled with soft vascular tissue, and are apparently intended to supply nutritive material to both the proliferated and non-proliferated portions of the cartilage.

The calcareous impregnation takes place in the cartilage cells before the matrix is attacked. The changes in it can therefore be observed with especial distinctness, on account of the absence of the usual deposition of granular calcareous particles from the matrix at the border of ossification. The capsule of the cell becomes thicker and thicker, gradually encroaching upon its cavity. At the same time canalicular pores are formed in the thickened wall. At last a vacant, irregularly-shaped space, closely resembling a lacuna of bone, is all that is left of the cavity of the cell. Scattered through the matrix are often seen rough white particles like isolated masses of lime. These spots of "provisional calcification" are sometimes sufficiently numerous to give a dotted appearance to a section of the cartilage.

In the case of the flat bones and the shaft of the long bones, when the sub-periosteal exudation becomes converted into bone, the trabeculæ are at first extremely thin, and the new osseous tissue remains for a long period unusually porous and vascular. Eventually, however, it becomes denser, and is transformed into a tissue of extreme solidity and hardness.

So long as the disease is in progress, the bones lose more and more of their firmness, getting softer and softer. This softening of the bones is due, as has been already described, to the gradual absorption of bony tissue from the interior, and the continued proliferation on the surface of new soft matter which is slow to calcify. The consequence is that the bones bend, or perhaps more commonly break on one side, like a stick of green wood.

When the disease becomes arrested consolidation begins, and the bones acquire greater firmness and consistency. The process of consolidation has been compared to the calcification of callus in ordinary fractures. In the long bones calcareous nuclei, the rudiments of new bony tissue, appear in the greasy gelatinous matter deposited beneath the periosteum at the circumference of the shaft. These enlarge and unite; the layers of bone get thicker and thicker; and the new tissue, thus acquiring consistence, hardens gradually into a compact substance like ivory. In the flat and short bones the effused matter is partially absorbed, so as to restore the normal spongy tissue.

The occipital bone sometimes differs from the other bones of the skull in being the seat of a special change. In the condition called cranio-tabes, spots are found in this bone where the osseous tissue is thin, transparent, of a yellowish-red colour, and contains scarcely any spongy substance. By holding the bone against the light the extent of the thinning can be readily seen. When looked at from the inside, depressions are found which correspond to the underlying convolutions of the brain. Vogel divides the process by which these changes take place into two stages; a first stage, in which there is deficient deposition of phosphates in the external bony layers all over the skull; and a second stage, in which absorption takes place in the softened parts where the pressure of the brain is felt. Sometimes the thinning of the bone is so extreme that the osseous tissue almost entirely disappears in the affected spots; the pericranium and the dura mater then come into contact, having between them merely relics of bone still unabsorbed.

Analysis of rickety bone shows that the bone contains 79 parts of organic to 21 of inorganic matter; the proportions thus differ very much from those existing in healthy bone, where the inorganic matters are largely in excess of the organic, being as 63 to 37.

Moreover, the animal matter yields no gelatin on boiling, and at an advanced period of the disease is said by Simon to yield neither gelatin nor chondrin. Schlonberger and Friedleben have obtained perfect gluten from rickety bone.

The softening of the ribs, and consequent deformity of the chest, produces certain morbid conditions in the contents of the thoracic cavity. The influence exercised by the softened ribs upon the course and termination of bronchitis has already been described; but there are, besides, two special lesions of the lung, which are invariably present, and always in the same situation in every case of rickety chest-distortion. These lesions are emphysema and collapse.

The emphysema occupies the whole length of the anterior border of each lung, extending backwards for about three-quarters of an inch from the free margin. The mode of its production is explained in the following way. At each inspiration the ribs sink in, and the lateral diameter of the chest is narrowed at the part corresponding to the line of union of the ribs with their cartilages. While, however, the lateral diameter is thus diminished, the antero-posterior diameter is increased by the thrusting forwards of the sternum. Air, therefore, is forced in excess into the lungs at that part so as to fill up the resulting space, and over-distension of the air vesicles is the result.

Collapse of the lung is produced by the recession of the ribs during inspiration. The collapsed portion forms a groove just outside the emphysematous part, separating it from the healthy lung. This groove corresponds to the line of nodules which represent the enlarged ends of the ribs, and which project inwards into the interior as much as, or even more than, they project exteriorly. During inspiration the ribs sink in, and the nodules are forced against the lung beneath them, so that they compress the pulmonary lobules at those points, and close them against the advancing air.

These two lesions are, therefore, quite independent one of another; and although they invariably occur if there is much softening of the ribs, yet they do not stand to one another in the relation of cause and effect.

The collapse which is sometimes found to occupy the posterior and inferior parts of the lung, and occasionally some parts of the upper lobes, is the result of plugging of a tube with mucus. The mechanism of this has already been described. It is only found in bronchitis.

Another result of the rickety chest is the circumscribed opacity on the visceral surface of the pericardium, known by the name of "white patch." This, although uncommon in children generally, is very common in rickety children. Its seat is usually the left ventricle, a little above its apex, just at the point where the heart at each beat comes in contact with the nodule of the fifth rib. In this case friction against the bone is evidently the cause of the white patch, and this is a strong argument in favour of the "attrition theory" generally. The same thing is often seen on the spleen, which, rising and falling with respiration, is rubbed against a projecting rib nodule. It is distinguished from the result of embolism by not extending deeper than the fibrous coating of the organ.

The pathological changes which occasionally take place as a result of rickets in the lymphatic glands, liver, spleen, and other internal organs, have been investigated by Dr. Dickinson. All the organs are tough and solid to the touch, and are heavy out of proportion to their size. The changes they undergo appear to be analogous to those which occur in the bones. They are not dependent upon any foreign growth or deposit in the tissues, but consist in an irregular hypertrophy of their fibroid and epithelial elements with, at the same time, a deficiency in their earthy salts.

The *liver* is usually larger than natural. It is hard, dense, and elastic to the touch, and is pale from containing little blood. The fibroid tissue in the organ is everywhere increased. Within the smaller portal canals the fibroid sheet is seen to have twice its natural thickness, and the yellowish acini are bounded by a thin pinkish or greyish line. Within the acini the cells seem more closely packed than in health, as if from excess of epithelial growth. These epithelial cells are not rich in oil globules.

The diseased *spleen* varies very much in size. Sometimes it can just be felt below the ribs; but often it projects downwards into the abdomen as low as the level of the umbilicus. It may measure as much as eight inches from above downwards, and four inches from side to side. The organ is hard and resistant, and its substance is tough and elastic, so that thin sections can be cut without difficulty. On the surface it is deep red or purple in colour, dotted with smooth white spots (enlarged malpighian corpuscles), which have sometimes been mistaken for grey granulations. If very large, a section is "mottled with pale buff material finely intermixed with the deeper colour." Only a little pale blood can be squeezed from the cut surface, for the vessels contain less blood than in health. By the microscope the trabeculæ are seen to be swollen irregularly, and the threads forming the meshes are thicker than natural, often as thick as the spaces they inclose. At the same time there is abnormal development of the contents of the meshes, and the corpuscles are crowded together.

The lymphatic glands, especially those of the mesentery, are apt to be enlarged and hard. On section they are white and opaque, from accumulation of their cellular and corpuscular contents.

These changes are not present in every case of rickets; and the organs, even when enlarged, are not always increased in size as a result of the lesions above described. In rickety children who are much enfeebled and wasted by long-continued intestinal catarrh the liver is often found to be swollen from fatty infiltration. In other cases, if the child has suffered from chronic interference with the function of the lungs from repeated attacks of pulmonary catarrh, a chronic congestion of the liver is induced which gives rise to considerable enlargement. The spleen, again, may be simply hypertrophied, undergoing a change similar to that which is often seen in cases of inherited syphilis, or in children suffering from the ague cachexia. Like the liver, too, it may be swollen from chronic congestion.

The brain is usually larger than natural; but the increase is apparently due in many cases to a true hypertrophy. In a case noted by Dr. Gee, this organ weighed fifty-nine ounces; it was of natural consistence, not toughened or hardened, and the grey and white matter appeared to retain their normal proportions. In another case, the brain weighed forty-two and a half ounces, and also seemed healthy, although of such unusual size. The disease is said to be in the neuroglia, not in the nerve elements.

The voluntary muscles are small, pale, flabby, and soft, but do not owe this appearance to fatty degeneration, for there is no excess of olein. Under the microscope their fibres are softer and paler than natural, with the striæ very indistinctly marked.

The urine in rickets is pale. The amount of urea and uric acid is diminished; but there is increase in the amount of the earthy phosphates. This increase is stated to be greatest at the beginning of the bone softening, and to become less marked when the disease is further advanced, and the bones are undergoing distortion. Free phosphoric and lactic acids have been observed, and it is not uncommon to find a sediment of oxalate of lime. In cases where sweating is profuse the diminished secretion of water by the kidneys may cause such concentration of urine that uric acid sand is deposited. This is especially likely to happen if the child be at the same time suffering from acidity, the result of fermentation of food.

From the above description it will be seen that rickets is not merely a disease of the bones, but one which affects the tissues of the body very widely. Of late, considerable attention has been given to cases of bony deformity in the child, and it has been asserted that in some instances in which extensive osseous changes have been noticed in the young subject the lesion is more allied to osteomalacia than to true rickets. The two conditions are essentially dissimilar, for while in rickets ossification is imperfect from arrested calcification of new bone-forming material, in osteomalacia softening is the consequence of re-absorption of the lime salts from bone completely ossified. Dr. Rehn of Frankfort has reported the case of a little girl, aged eighteen months, in whom there was much softening of the long bones, but the epiphysial ends were only enlarged to a very slight degree, and in the bones of the lower limbs were apparently normal. Those bones, also, were quite straight, and the whole skeleton was excessively thin. For these reasons Dr. Rehn was disposed to believe that the lesions ought rather to be classed under the heading of osteomalacia than under that of rickets, although a rickety element in the case, shown by a considerable formation of sub-periosteal deposit, was admitted. The question is one of great interest to the pathologist, but requires further observations for its elucidation.

Diagnosis.—The early diagnosis of rickets is of great importance: few diseases are so readily curable in their early stages, or so fatal if allowed to continue unchecked. Plumpness is no proof of the absence of rickets, for a child may be extremely fat, and yet rickety; on the other hand, wasting is no proof of its presence, for a child may be reduced almost to a skeleton without presenting a single symptom of the disease.

In a well-marked case of rickets the head elongated from before backwards; the square, straight, prominent forehead; the small face; the beaded ribs; the deformed chest; the tumid belly; the twisted, distorted limbs; the immobility and quiet of the little creature as he sits—if he can sit—with bowed spine and head thrown back, gazing around him with vacant eyes; all these characteristic symptoms leave no room for doubt as to the nature of the disease.

It is only when the disorder is at its very commencement, or appears first about the end of the second year, that it is liable to be overlooked. A mild form of rickets, consisting merely in a little enlargement of the wrists and ankles, slight beading of the ribs, arrested or late dentition, and a large fontanelle, is exceedingly common, even in wealthy families. The parents from these signs alone never suspect disease, and indeed the plumpness of the child, which is often very considerable, is the subject of much admiration. The absence of teeth is looked upon as an innocent peculiarity, and cases are quoted of relations, male and female, in whom the same tardy dentition was observed. It is not until some complication arises, or the disease enters a new phase, that anything is noticed to excite alarm. But late cutting of the teeth is seldom a natural condition. In most cases of retarded dentition the symptoms of rickets may be noticed, and if the tenth month passes away without the appearance of a tooth, suspicions of the disease should always be excited.

Lateness in walking attracts the attention of parents much more frequently than tardy dentition; and children are often brought for advice on account of "weakness in the legs." In these cases, owing to the inability of the child to support himself, even for a moment, when held upon his feet, essential paralysis may be suspected. An examination, however, will show that although there is no power of standing, yet power of movement is by no means lost. The child draws up the legs when the soles of the feet are tickled, and the muscles, although weak, are not absolutely powerless. Other symptoms of rickets are also present.

When the want of muscular power has increased to such a degree that the child is incapable of movement, the incapacity is general, and is not confined to one or more limbs. Moreover, at this stage the deformities of bone are usually well marked, and the chest-distortion is very great.

Relaxation of the ligaments, and consequent unnatural mobility of the joints, are almost always due to rickets. They are common results of the disease when it occurs after the end of the second year, and may be present although there is no osseous deformity, and very little enlargement of the ends of the bones. All the articulations are affected, but the knees and ankles seem to suffer most, as they bear the weight of the body. The yielding of the ligaments of these joints may be so great as to make walking difficult or even impossible; but where the relaxation is extreme there is usually combined with it more or less softening and distortion of the bones.

In rickety children, before cutting for stone, the size of the pelvis should be carefully studied, for narrowness of the outlet may create great difficulty in removing the calculus. By noting the degree of stunting and distortion of the lower limbs, a fair guess may be made as to the degree to which the pelvis is likely to have suffered from arrest of development and softening of its bones. An examination *per anum* will, however, at once remove any doubts: by the finger introduced into the rectum we can readily explore the entire pelvic cavity, and the size and capacity both of the brim and of the outlet can by this means be satisfactorily ascertained.

There is one complication of rickets which it is very important to recognize early. This is scurvy. Sponginess of the gums, or any unusual tenderness of the limbs, should at once attract attention. In cases of advanced rickets there is almost always a certain amount of tenderness; but if this symptom be present in an extreme degree, or be noticed in cases where the bone changes are trifling and the general features of the disease little pronounced, it should at once suggest scurvy. Again, local swelling of a limb, unaccompanied by fluctuation or redness of the skin, is a very suspicious sign, and one which should always make us inquire carefully into the feeding and general management of the patient.

In cases where the scorbutic phenomena are very severe, and separation of epiphyses has occurred with symptoms of pseudo-paralysis, the case is distinguished from one of inherited syphilis by the absence of other signs of that diathetic disease.

Prognosis.—The danger of rickets lies principally in the complications. As long as the disease remains simple, and the bone-softening is not extreme, the prognosis is very favourable.

In estimating the danger of any particular case, attention should always be paid to two points:

The amount of chest-distortion.

The presence or absence of disease of the spleen, and glandular system generally.

If the chest be much distorted, and the softening of the ribs great, there is always cause for anxiety. Owing to the difficulty of respiration in these cases, there is deficient aëration of the blood (shown by the lividity of the lower eyelid and of the mouth), and consequent deficient oxidation and removal of waste matter. The slightest catarrh, as has been before explained (see p. 141), adds a further obstacle to due aëration; and catarrhs are always liable to occur, however carefully chills may be guarded against, owing to the extreme sensitiveness of a rickety child to changes of temperature. Under such circumstances the patient's life is always in danger, for a slight cold, which in a healthy child would be scarcely worth notice, or which would be easily treated by domestic remedies, will be sufficient in a rickety child to cause fatal collapse of the lungs. If a child, the subject of this disease, begins to cough, no prognosis should be hazarded until the movements of the chest during respiration have been carefully watched; and here more useful information can often be gained by the eye than by the stethoscope.

The danger is in direct proportion to the degree of recession of the ribs during inspiration.

Disease of the spleen and other internal organs does not add to the gravity of the prognosis so much as might be expected. No doubt the child is less likely to recover his health than if these organs were free from degeneration; but cases where the spleen is enlarged do not necessarily end fatally. On the contrary, such children often do well.

On account of the danger of catarrh, disorders in which it is a prominent symptom are of course especially formidable to rickety children. On this account measles and whooping-cough are greatly to be dreaded.

Of the other complications, diarrhœa is the most serious. Convulsions are very common, but are usually harmless. Sometimes laryngismus stridulus causes death.

The combination of hydrocephalus with rickets is seldom attended with danger.

Scurvy is a more serious complication; but if recognized early and treated promptly with antiscorbutic remedies and appropriate diet, the symptoms in most cases will quickly disappear.

No indication for prognosis can be derived from the age of the child. A slight degree of rickets is very common in infants of seven months old, and, when the causes which produced it are removed, it ceases as readily in them as in older children. The severity of the disease depends upon the intensity and the continuance of the causes of which it is the result.

Causes.—Rickets is a general disease, for it affects the tissues of the body very widely; but it cannot be included in the same class of maladies with acute tuberculosis, scrofula, and syphilis. The latter, which are often called the diathetic diseases, have special peculiarities which separate them very distinctly from a disease of pure malnutrition, such as rickets. A diathesis has been defined as "that character of the constitution which tends to the repeated expression of some form of ill-health, always in the same way." * In other words, it is a constitutional predisposition to repeated manifestations of a certain invariable form of disease. Now, in rickets, there is, strictly speaking, no constitutional predisposition. It is the result of certain known causes, without which the disease cannot be produced, but under the influence of which any child whatever (with certain exceptions, to be afterwards noticed) will become rickety. That the disease occurs amongst the children of the rich as well as amongst the poor is no argument against this view, for wealth cannot buy judgment, and education is no guarantee against foolish indulgence. We know that a child may be in reality starving, although fed every day upon the richest food, for he is nourished, not in proportion to the nutritive properties of the food he swallows, but in proportion to his capability of digesting what is given to him. If, therefore, he be supplied with food unsuited to his age, the result is the same, whether he live in a palace or a cottage.

Cases occasionally occur where the mother, exhausted by chronic disease, or other depressing cause, bears children feeble at their birth, and who very rapidly become rickety. But these are not true cases of constitutional predisposition. The child is born suffering already from the effects of deficient nutrition in the womb. He is then at once suckled with poor watery milk, or is brought up by hand and stuffed with all the hurtful trash with which the ignorance of mothers prompts them to supply the deficiencies of their milk. The natural result of such imperfect nourishment follows, and rickets declares itself. But here the child can only be said to have been predisposed to rickets in the sense that he was born suffering from a condition of which rickets is the final and

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* Science and Practice of Medicine, by W. Aitken, M.D., Edinburgh, 2nd edition, 1863.

most striking stage. Rickets does not produce mal-nutrition, but mal-nutrition produces rickets. The infant is not born weakly because he has a rickety predisposition, but he falls a victim to rickets because he was born weakly.

Moreover, for the full development of the disease, it is essential that the same causes by which nutrition was first rendered defective should continue in operation. If measures are taken to improve nutrition, this result does not follow, for when well cared for, and supplied with proper nourishment, the child in all cases becomes strong and healthy. Rickets is no disease which *must* run its course. By judicious treatment it may be stayed at any point of its career; and the treatment required is merely food—food which nourishes, and drugs which are not so much medicines as food under another name.

Again, in the true diathetic diseases of childhood, hereditary tendency plays a very important part, but in the case of rickets there is very little evidence of such a cause. Out of the thousands of rickety children there will no doubt be many, one or the other of whose parents was rickety before them; but the same thing may be said of any other common disorder. It is always difficult where many conditions unite in the causation of a disease to separate the share which hereditary tendency takes in its production, but no special facts have yet been brought forward to show that rickety parents are more likely to have rickety children than parents who have been altogether free from the disease—the other conditions remaining the same.

Rickets, then, is not a diathetic disease in the sense in which tuberculosis and syphilis are diathetic diseases. Before the alterations in structure actually occur there is nothing in the appearance of the child to indicate the disease from which he is about to suffer. It is acquired under the influence of certain causes, lasts as long as those causes continue in operation, and, unless the structural changes are so extensive, and the general strength so reduced, as to forbid recovery, passes off when the causes are removed.

These causes must be looked for in all those conditions which interfere with the proper nutrition of the child. Ill-health or weak constitution of the mother affecting the nutrition of the fœtus in utero, and after-birth of the child deteriorating the quality of the breast-milk; improper feeding generally; ill-ventilated rooms, damp, cold, dirt, want of sunlight, want of exercise. The continued influence of these causes will produce the disease, or rather, will produce that unhealthy condition of the body of which rickets is the direct consequence. The preliminary stage, that which marks the beginning and progress of mal-nutrition, and in which the strength is being gradually reduced to the point at which rickets begins, may be long or short according to the degree of vigour of the child, and the degree of intensity with which the causes operate, or may even be absent altogether. Its place may be taken by any disease which interferes seriously with the assimilative power, and causes sufficient impairment of the general strength. We thus get another set of causes, which may either act independently of the others, or may most powerfully intensify their influence. Thus rapidly recurring attacks of diarrhœa, chronic vomiting, measles, bronchitis, broncho-pneumonia, in fact, all the exhausting diseases, may have this effect.

Too early weaning is sometimes stated to be a special cause of the disease. It is no doubt true that to deprive a young child of breast-milk which he can digest, and to supply him instead with food which he cannot digest, is certain to be hurtful. In England, however, the tendency is rather to keep the child too long at the breast, to accustom him to look to that for his sole nourishment after the time when some additional food is required. In either case the supply of nutritive material is equally deficient, and the effect upon the health of the child must be equally unfavourable.

The connection between syphilis and rickets is interesting. By some writers great importance is attributed to the influence of the former disease as a cause of rickets: indeed, the late M. Parrot ventured so far as to declare that rickets was invariably the consequence of a hereditary syphilitic taint. The reasons for his belief adduced by this distinguished observer were founded principally upon morbid anatomy, especially upon a certain similarity of lesion noticed in the epiphysial ends of the long bones in the two diseases. There is no doubt that rickets often occurs in children the subjects of hereditary syphilis, just as it may arise in any case where the patient is enfeebled by mismanagement or disease; but the clinical history of the two maladies is so different that in this country, at least, M. Parrot's doctrine has met with little acceptance.

With regard to the influence of tubercle, rickety children, like the subjects of any other chronic disease, may fall victims to secondary acute tuberculosis; and a phthisical mother may bear rickety children; but a child in whom the tubercular diathesis is marked, seldom, if ever, becomes rickety. It is also rare to find a case of rickets occurring in a family other children of which are the subjects of tuberculosis.

Prevention.—If any of the former children of the family have been rickety, especial attention must be paid to the diet and general management of the new-born babe. The mother may still suckle the infant during the first month, but after that time she should give up all idea of rearing the child from her own breast, and a wet-nurse should be provided. If from circumstances this is impossible, the breast-milk must be limited to two meals a day; the child being fed at other times upon cow's milk and lime-water, or any other suitable diet, as recommended in an earlier part of this volume. At the same time, all the other precautions so essential to perfect health must be carefully observed. Perfect cleanliness, warm clothing, fresh air, well-ventilated rooms, sunlight, are all indispensable. If the parents reside in a cold, damp situation, the child should, if possible, be removed to a neighbourhood where the quality of the air is drier and more bracing. For full particulars as to the best method of preventing the occurrence of rickets the reader is referred to the section on the treatment of simple atrophy. If the management of the child be conducted according to the rules there laid down, rickets cannot occur, for the causes which produce the disease will not be in operation.

Treatment.—In the treatment of rickets, our first care must be to endeavour to restore healthy nutrition. This can only be done by attention to diet and to general hygiene, taking care at the same time to correct any disordered condition of the alimentary canal which may be present to interfere with the proper digestion and assimilation of the food supplied. This is indispensable as a first step, for to give tonics while the causes which have produced the disease, and sustain it, continue in operation, is a course which cannot possibly be attended with any good result.

In almost all cases the bowels will be found to be rather relaxed, two or three stools being passed in the course of the day, consisting of offensive, putty-like matter, mixed largely with mucus, often greenish, and occasionally streaked with blood from the straining efforts with which they are evacuated. The fœtor is due to decomposition of the undigested food. It is best to begin the treatment with a gentle laxative, such as a teaspoonful of castor oil, or a small dose of rhubarb and soda. The bowels having been thus relieved, alkalies should be given, with a little opium, in some aromatic water. The following prescription is useful in these cases, or some of the medicines ordered for a similar condition of the bowels in the treatment of simple atrophy may be adopted:—

℞. Tinct. opii, ♏j;
Sodæ bicarb. gr. iv;
Sp. ammon. aromat., ♏ij;
Sp. chlorof., ♏ij;
Aq. cinnamomi ad, ℥ij.
To be taken three times a day.

The opium is of great use in diminishing the abnormal briskness of the peristaltic action of the bowels, and should never be omitted from the mixture so long as the stools present the appearances which have been described. Under such or similar treatment the motions will be found in a few days to assume a more healthy character; griping, if previously present, will be diminished, or will have altogether ceased; and the general condition of the patient will be much improved. At the same time the diet of the child must be regulated to suit the degree of debility to which he may be reduced, remembering that the greater his weakness, the more nearly does his digestive power resemble in degree that of a new-born infant. Full directions about diet have already been given in a former chapter (see Treatment of Simple Atrophy), and need not here be repeated. It may, however, be remarked that it will usually be found necessary very greatly to reduce the quantity of farinaceous matter which is being taken. Under the mistaken notion that such food is especially nutritious and easy of digestion, weakly children, whatever their age may be, are commonly made to depend for their support chiefly upon sago, arrowroot, tapioca, and similar articles of diet. The amount of this food must be therefore considerably restricted, according to the rules already laid down, and its place should be supplied by milk, gravy, strong beef-tea, minced meat once cooked, yolks of eggs lightly boiled, &c., according to the age and strength of the child.*

Plenty of fresh air is indispensable to the successful treatment of rickets. The child should be taken out regularly into the open air, and as he gets gradually stronger should pass more and more of his time out of doors. The quality of the air is of much importance, and sea-side places, where the air is dry and bracing, as Westgate, Scarborough, Brighton, and Eastbourne, are especially to be recommended. Rickety children are often kept confined to the house during the winter months on account of their tendency to chills, and it may be objected to the medical practitioner that "whenever the child goes out he catches cold." In these cases it will be usually found on examination that the child's feet are habitually cold. If care be taken that the feet are thoroughly warm before the child leaves the house, and if at the same time the body and limbs are warmly wrapped up, the patient may be sent out of doors, all through the cold season, not only without danger, but with the greatest possible benefit to his health. In every case of rickets the belly should be kept covered with a flannel bandage† during the day, and the child should wear next his skin a flannel or pure woollen "combination" garment.

It is more often within the house than without that the child takes cold. Not seldom it is in the night that the chill occurs. While asleep in his bed the patient sweats profusely. Inconvenienced by the heat he kicks off the bed coverings and throws his bare legs on to the counterpane. As he lies thus exposed, his naked, perspiring body is as wet as if it had been dipped in water, and the evaporation which takes place chills the surface sufficiently to induce a very decided catarrh. I have known many an instance in which obstinate diarrhœa in a rickety subject has been kept up by this means. It is advisable, therefore, in all cases where a rickety child is subject to frequent and mysterious catarrhs, to make inquiry into this matter, and to take measures to prevent the child uncovering his body in his sleep. Infants should be put into a loose flannel bag which can be tied under the arm-pits. In this they can kick about their limbs without risk of exposure. Older children may wear woollen "combinations." When these precautions are taken, the bed coverings must be light. More than one blanket will seldom be required.

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* See Chap. XI., Diets, 5, 6, 7, 8, 10, 11 and 18.

† The abdominal bandage has another use in retarding the too rapid descent of the diaphragm. This, when the bones are much softened, affords great relief.

Great cleanliness must be observed. The whole body should be well washed every morning with soap and warm water, and be sponged every evening with warm water; and as he gets stronger, warm or tepid sponging with salt water may be used to the back and loins. The bed and bedding should be removed from the room every morning, and be freely exposed to the air; the sheets must be changed frequently and must be carefully aired. The ventilation of the nurseries must be attended to, and at night a lamp placed in the fender is useful to promote a free current of air.

The influence of the preceding measures is usually most marked, and it is at this time that tonic medicines are so valuable. They ought not, however, to be given until, by suitable treatment, the motions have become healthy and the tongue clean.

Iron is one of the most important medicines we have at our disposal. A good form for its administration is the following:—

℞. Liq. ferri pernitratis;
Acidi nitrici diluti, āā ♏ijss;
Glycerini, ♏v;
Infusum calumbæ, ad ʒij. M. Ft. haustus.
To be taken directly after food, three times a day.

If the debility is very great, the ammonio-citrate may be given with sal volatile—

> ℞. Ferri et ammoniæ citratis, gr. ij ;
> Spirit. ammoniæ aromat.,
> Sp. chloroformi, āā ♏ij ;
> Infusum calumbæ, ad ʒij. M. Ft. haustus.
> To be taken one hour before food, three times a day.

Or the tincture of the sesquichloride may be combined with dilute hydrochloric acid and spirits of chloroform in the same infusion. Other preparations of iron are recommended, as the syrup of the iodide, the syrup of the phosphate, and Parrish's "Chemical Food." On account, however, of the tendency to acidity, these syrups do not always agree.

Chalybeate waters, such as those of Tunbridge Wells, are of service.

Quinine* is very useful. It may be given either with dilute nitric acid or in the form of the double citrate of iron and quinine.

The lime salts are favourite remedies with some practitioners, and when combined with iron, as in Parrish's "Chemical Food," are no doubt sometimes of service; but in such a case the benefit must not be attributed wholly to the lime.

Tannin is recommended by Dr. Alison. It may be given in doses of from half a grain to a grain, two or three times a day, in a little dilute nitric acid. The author has seen very marked improvement follow the use of this drug.

The remedy, however, which justly takes the highest rank in the treatment of rickets is cod-liver oil. The influence of this drug in improving general nutrition is seen almost immediately: and when given under favourable conditions—in cases, that is, where the deficient sanitary arrangements which originated the disease have been corrected—the rapid change for the better in the general condition of the patient, and the quickness with which the more pressing symptoms disappear, will often be a matter of surprise.

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* Quinine is best given to young children in milk. Mr. Batterbury has pointed out that milk not only dissolves quinine, but also to a great extent disguises its bitterness. It has been suggested that the drug should be prescribed suspended in glycerine (one grain to the drachm), and that the nurse should be directed to administer the dose in a wineglassful of milk.

The oil may be administered in a tonic mixture, but it must not be given at first in too large doses. To begin with, ten to fifteen drops may be poured into each dose of the medicine, and the quantity can be gradually increased to a teaspoonful. Cod-liver oil may be usefully combined with iron, as in the following mixture:—

℞. Ferri et ammoniæ citratis, gr. ij;
Tinct. calumbæ, ♏v;
Olei morrhuæ, ♏x;
Aq. calcis ad ʒj. M. Ft. haustus.
To be taken after food, three times a day.

During the administration of the oil the stools should be examined from time to time. Any smell in them of the oil is a sure sign that more is being given than can be digested, and the quantity must be reduced.

With regard to the bone deformities:—If the tibiæ are much bowed the child should be prevented as much as possible from walking until reconsolidation of the bones has sufficiently advanced. Careful watching, however, is required to prevent his getting upon his feet, for as his strength improves his delight in his newly-acquired powers is prodigious, and he seems anxious by incessant activity to make up for his previously enforced quiet. Light carefully padded splints should be applied to the legs, and it is advisable that the supports should project below the feet, so as to render it impossible for the patient to stand. In recent cases, where the tibiæ are bowed forwards, or forwards and outwards, the plan may be adopted of forcibly straightening the bones, and then applying splints. This is done without difficulty in children under two years of age. If the bone should even snap in the operation the accident does not interfere with the process of cure, for union readily takes place. It must be remembered that this plan is only applicable to cases where the deformity has been rapidly developed and is *still recent*.

When the tenderness has subsided, the spine, and back generally, are much strengthened by careful shampooing. Each morning, after his bath, the child should be laid upon his face on the bed, and the whole back should be well and firmly rubbed with the open hand from the neck to the buttocks. The frictions should be continued for about ten minutes. In the evening the same process may be repeated before the child is put to bed.

In cases where the ligaments of the joints are very weak and relaxed, a carefully applied elastic bandage affords the best support.

The profuse sweating from the head can be controlled by belladonna, either given internally or applied locally as a liniment. If given by the mouth, care must be taken to give a sufficient quantity, remembering the great tolerance of children for this drug. Ten drops of the tincture may be given at first three times a day to a child of twelve months old, or twenty drops can be given in one dose at bedtime. If the sweating continues the quantity of belladonna must be increased.

Treatment of the complications.—The first symptoms of *catarrh* should always be attended to at once, for there is no complication which is so dangerous to rickety children.

Prompt counter-irritation to the chest should be at once adopted, and this is found to be more effectual when of a broad flannel bandage to the belly should be insisted upon.

When either of these complications (diarrhœa or catarrh) is present, the diet must be at once altered to suit the temporarily reduced power of digestion.

In the case of *convulsions* and *laryngismus stridulus* the tendency to these nervous seizures is counteracted by the measures recommended for the general treatment of the rickety constitution. In proportion as nutrition becomes restored the proneness to convulsions also disappears.

When called to a child suffering from a convulsive attack, we should at once give orders for the preparation of a warm bath (90° Fahr.). While this is being done we can search for some local cause capable of explaining the nervous commotion. Scybalous lumps in the bowel should be removed by a copious enema; irritation of the stomach must be relieved by a spoonful of ipecacuanha wine; a tense swollen gum requires the use of the gum-lancet; and signs of pain and tenderness about the ear suggest the employment of hot fomentations. If the aural meatus be unquestionably inflamed, it can be plugged with cotton-wool, while a leech is applied to the concha.

A young child should not be kept for more than ten minutes in the warm water. Afterwards, if the fits continue in spite of treatment, prompt measures must be taken to subdue the excitement of the nervous system. One of the best remedies in these cases is the nitrite of amyl, as recommended by Dr. A. E. Bridger. Whatever be the cause of the attack, the inhalation of one drop of the nitrite usually arrests it at once. If preferred, the remedy may be given by the mouth, and half a drop for a child of twelve months old, suspended in glycerine and mucilage, can be administered every half-hour until the convulsions cease. Afterwards, a dose every three or four hours will prevent any return of the nervous troubles. The hypodermic injection of morphia is another useful method of controlling the eclamptic seizures. In this condition of the nervous system there seems to be a certain tolerance for the narcotic. For a child of twelve months old one twenty-fourth of a grain may be introduced under the skin, and the injection can be repeated every twenty minutes until the convulsive movements are at an end.

To prevent the recurrence of the fits bromide of potassium or ammonium in doses of four grains, or the hydrate of chloral in doses of two and a half grains, may be given three or four times a day to a child of one year old. Chloral is also useful during the actual attacks. If the child cannot swallow, four or five grains dissolved in a little water can be thrown up the rectum.

Laryngismus is quickly arrested, as a rule, by the chloral treatment. It is important that this complication be not spoken of too lightly, for it sometimes unexpectedly proves fatal. The derangement may often be cured at once by bathing the child's whole body two or three times a day with water of the temperature of 60° Fahr. It is well to remember that although fresh air is of extreme importance in these cases in forwarding the cure, the utmost care must be taken that the child before leaving the house is properly protected against the cold, for a catarrh greatly increases the gravity of the attacks. If the child be seen during the paroxysm, this may be usually made to cease immediately by applying a bottle of ordinary volatile smelling-salts to the patient's nostrils. In very bad cases it is important to pass the finger into the back of the child's throat, so as to bring forward the tongue, and release the epiglottis, should the latter be incarcerated.

The large size of the head in these rickety children often gives rise to a suspicion that the fits are due to hydrocephalus, and very active treatment is resorted to, sometimes with disastrous results. Rickety children cannot bear lowering measures at any time, and to reduce the strength while convulsions are actually present, is only to increase the number and the intensity of the fits.

If symptoms of scurvy are noticed, the child should be placed without loss of time upon an anti-scorbutic regimen. All tinned and preserved foods should be at once discontinued, and fresh milk, raw meat-juice or pounded raw meat, and a proper proportion of vegetable should be substituted for his former unwholesome diet. The flower of broccoli, young French beans, vegetable marrows, asparagus heads, and Spanish onion, if thoroughly boiled and afterwards passed through a fine sieve, may be given safely to a child of twelve months old. A certain quantity of fresh fruit can be also allowed; and lemon-juice is usually well borne by scorbutic infants. If the strength be much reduced, port wine or the St. Raphael Tannin wine may be given, diluted with water. For medicine, the child should take cod-liver oil, and quinine dissolved in lemon-juice and sweetened with syrup; or five to ten drops of the tincture of perchloride of iron well diluted.

For spongy gums Dr. Cheadle recommends the glycerines of tannin and carbolic acid (fifteen drops of each to the ounce of water) to be applied with a brush. The child should occupy well-ventilated rooms, and should pass much of his time in the open air. For local application to the limbs wet compresses closely applied and covered with oiled silk should be made use of. If the epiphyses have separated, splints will be required.

CHAPTER V.

INHERITED SYPHILIS.

Inherited Syphilis.—Appearance of first symptoms—Before birth—At birth—After birth—Sleeplessness at night—Snuffling—Necrosis of nasal bones—Eruptions on skin—Seat—Varieties—Scaly patches—Ecthymatous pustules—Papules—Tubercular spots—Ulcers—Mucous patches—Cracks and fissures—Complexion—Cry—Openness of fontanelle—Disease of bones—Pseudo-paralysis—Influence of the disease on general nutrition—Delayed symptoms—Syphilitic teeth—Relapses.

Morbid Anatomy.—Lesions of the bones—The mucous membranes—The internal organs.

Diagnosis.—By general symptoms—By history—By examination of other children of the same family.

Causes.—Transmission of taint from father—From mother—Mother seldom escapes if father affected—Colles' law—Twins not always equally affected—Other modes of infection.

Prognosis.—From observation of parents—Of child—Importance of considering the intensity of the general cachexia—Importance of certain special symptoms.

Prevention. Treatment.—Two objects—Treatment to be begun early—Remarks on the non-mercurial treatment—Treatment by mercury—Different preparations—External applications—Ointment—Mercurial baths—Improved general nutrition—Diet—Peculiarities of the milk in syphilitic mothers—Other foods—Cod-liver oil—Warmth—Cleanliness—Treatment of vomiting and diarrhœa—Local applications—Tonics.

INHERITED Syphilis, as it attacks the infant, presents a combination of the so-called secondary and tertiary stages of the disease, the primary stage being absent. The skin and mucous membranes invariably exhibit the characters of secondary syphilis, and these external manifestations are often combined with others indicating serious lesions of the bones and internal organs. The disease may first show itself in the child at three different periods,—viz., before birth, at birth, or after birth.

If *before birth*, it occurs usually from the fifth to the seventh month of intra-uterine life. The child dies, and is born dead before the proper time. This disease is so common a cause of miscarriage, that when labour has repeatedly occurred prematurely our suspicions should always be excited, and we should make inquiry as to the previous health of the parents, so that by the proper treatment of one or both, the lives of succeeding children may be preserved.

If *at birth*, the symptoms are usually very severe. The child, although born alive, is emaciated, and looks shrivelled. He snuffles and cries hoarsely. A few hours after birth, an eruption of pemphigus appears, situated principally on the palms of the hands and the soles of the feet. The bullæ become filled with a semi-purulent liquid, and burst, leaving angry-looking sores. Spots of inflammation, with abscesses, are scattered through the thymus gland and through the lungs. The liver is indurated. The infant may linger on for a few days, or weeks, but these cases almost always prove fatal.

Although appearing at birth, the symptoms are not, however, always so marked as those described. The amount of flesh may be considerable, and the lesions of the internal organs may not be present. In such cases the child may recover, but the prognosis is exceedingly unfavourable.

If *after birth*, the child is born apparently healthy. He is often plump, seems strong, and presents no symptoms by which even the most practised eye can detect the disease lurking in his system. Sometimes, however, although offering no distinct symptoms of disease, there is yet a something which seems to hint at the approaching outbreak. The face is rather old-looking; the skin inelastic and unnaturally pale; the complexion dull and wanting in transparence.

After a time, varying from two weeks to six or seven months, although rarely after the end of the third month, evident symptoms of the disease begin to be observed. Before this, however, there is one symptom which has been little noticed by writers upon this subject as a sign of the inherited disease, but which is seldom absent. This symptom is obstinate wakefulness at night. The child when put to rest is uneasy and fretful, he cries almost unceasingly, and cannot be pacified. During the day he is more composed, but every night there is a repetition of the same disturbance, and his uncontrollable complaints are a source of the utmost perplexity and distress to his attendants. The crying is possibly excited by nocturnal pains in the bones similar to those affecting adults before the outbreak of the constitutional symptoms. On the appearance of the rash the sleeplessness does not at once subside, but it soon disappears under the influence of specific treatment. The outbreak of the general symptoms may be determined by some febrile attack, as one of the exanthemata, the eruption of which subsiding leaves the syphilitic rash in its place. In almost all cases one of the earliest signs of the disease is snuffling. The mother in the beginning attributes little importance to this symptom, and indeed does not usually mention it unless questioned specially upon the point, when she replies that the child has "had a cold" for a few days. Soon the mucous membrane lining the air-passages becomes more swollen, but even then there is not much snuffling so long as the child breathes through his mouth. When, however, he takes the breast, his difficulty of breathing through the nose becomes at once apparent. Each inspiration is accompanied by a slight snore, and as the obstruction becomes more decided he can only suck at short intervals, desisting frequently and lying with the nipple in his half-open mouth, so as to obtain a supply of air before making another effort to draw out the milk. Occasionally he snorts violently, as if in an attempt to clear away some obstruction, and this often causes serious alarm to the mother, who will complain that the child "seems as if he were going to be suffocated when he takes the breast."

After a time there appears from the nostrils a slight watery discharge, which may be tinged with blood. It is seldom profuse at first, and is often merely enough to give a glistening appearance to the openings of the nares. Gradually, however, it becomes more abundant, and acquires consistence, so that it forms crusts which block up the nasal apertures, and still further impede the passage of the air. The discharge is intensely irritating, and scalds the parts with which it comes into contact; producing cracks and little ulcerations about the nostrils and upper lip, which become encrusted with minute scabs. Diday, however, believes these external cracks and ulcers to be due to mucous patches, and to be independent of the discharge: the discharge itself he attributes to mucous patches developed on the Schneiderian membrane. In severe cases the ulceration thus set up within the nose may perforate the septum nasi, or lay bare the nasal bones, which may become necrosed in consequence of the exposure. Fragments of these bones are sometimes found in the crusts thrown off. The bones may also become loosened and sink down, so that the bridge of the nose is flattened, and looks broader. In rare cases snuffling is the only symptom of the disease: sometimes, but very rarely, it is completely absent throughout.

Soon after the beginning of the coryza, an eruption is noticed on the skin. It is usually first seen about the arms and perinæum in the form of flattened, slightly elevated spots, resembling very much in their colour the rust of iron, and which with a lens may be sometimes seen to be covered on their surface with minute scales. More commonly, however, no scales are visible, for as soon as formed they are softened by the natural moisture of the part and become detached. These spots are scattered over the perinæum, surround the anus, and speckle the scrotum or the labia. Sometimes the eruption begins as an erythematous blush, at first bright red, which covers the buttocks and perinæum, and may extend to the lower part of the belly. The colour soon gets more dingy, and has been aptly compared to the lean of ham. It becomes at the same time distinctly circumscribed, ending at its boundaries in an abrupt line. The coloured surface is scaly, and at its edges are seen the rust-coloured spots before described. The eruption is not limited to these parts; it often invades the folds of the joints, particularly the armpits, extends to the sides of the neck or the chin, and may be sprinkled all over the body. Other varieties of the rash are also found, as ecthymatous pustules, papules, tubercular spots, mucous patches; and ulcerations, the result of these eruptions, may also be present.

When ecthyma is seen in any quantity, the aggregation of the pustules presents a very peculiar appearance, and the general aspect of a part covered with such an eruption differs entirely from that just described. The eruption is usually seated on the buttocks and perinæum, and the pustules are more or less closely aggregated, the colour of the part varying according to the degree to which the pustules are separated. When crowded together, the general tint is a deep purple—not uniform, but broken up into patches of purple, separated by intervals where the colour is red. When the pustules are more widely apart, each one is seen to consist of a violet-coloured blotch, crowned with a thick, blackish crust, and surrounded by a deep red or copper-coloured areola. If placed sufficiently close, the adjacent areolæ may join, so that all of the skin which is seen between the neighbouring pustules is of the same reddish or coppery hue. The scabs cover an ulcer, which is apt rapidly to deepen, and, unless checked by early treatment, may penetrate deeply into the tissues, and produce very serious results.

The ulcerations which arise from the other forms of eruption are often linear, and are compared by Trousseau to the narrow grooves found in worm-eaten wood. They frequently leave linear cicatrices, which may exist for a long time an evidence of the past disease.

Mucous patches, when they occur on the skin, are seen as round or oval slightly elevated patches. They are soft, and something of the consistence of mucous membrane. Their colour is reddish or greyish, and the surface is kept constantly moist by a thin, offensive secretion. They are usually found by the side of the anus, at the commissures of the lips, about the genitals, between the fingers and toes, or anywhere else where the skin is especially delicate and moist. When they occur on the mucous membranes, they are commonly seen as irregularly-rounded white elevations, in the centre of which a point of excavation shows itself; this spreads, so that after a very short time only a single ulcer is observed. It is not uncommon to find them on the arches of the fauces, but they never exist, according to Trousseau, at the back of the pharynx. Still, on account of the difficulty often experienced in obtaining a good view of the back of the throat in a child, we can seldom be sure that there are no lesions on the posterior wall of the pharynx.

The skin of a syphilitic child is dry and parchment-like, and is often scaly, especially on the palms of the hands and the soles of the feet. Fissures are often seen between the fingers and toes, and may be found radiating from the anus and the corners of the mouth, and at the commissures of the eyelids.

A kind of whitlow is occasionally present from specific inflammation and suppuration of the matrix of the nail.

The nutrition of the nail being thus interfered with it gets dry, and falls off. M. Bouchut states that he has seen a case in which every nail, both on the fingers and on the toes, was thus affected.

The hairs of the eyelashes and eyebrows often fall out; the edges of the eyelids then become scaly. The colour of the face is yellowish, and has been compared by Sir W. Jenner to the colour of weak *café-au-lait*. It is different from the earthy tinge often seen in chronic diarrhœa, and must not be confounded with it. This tint does not spread to the rest of the body, but remains limited to the face, where it is most marked on the more prominent parts, being less noticeable on the deeper parts, as the internal angle of the orbit, and the hollow of the lower lip. Besides this peculiar tint of the face, there is a very striking pallor of the body generally, which is very slow to disappear, even after the subsidence of the other symptoms.

The cry of the infant is one of the most noticeable features of the disease; it is hoarse and high pitched, and when once heard is not difficult to recognize again. Its peculiar quality is, no doubt, due to an extension of the mucous patches to the larynx. Occasionally the hoarseness is accompanied by attacks of laryngismus stridulus.

As a rule the fontanelle in children suffering from this disease is very widely open. It appears as if the cachexia exercised some influence in retarding ossification of the bones. Strangely enough, however, the growth and development of the teeth do not appear to suffer; indeed the contrary is found to be the case, for the teeth are often cut very early, and with remarkable ease. It is not uncommon to see the front teeth appear while the body is yet covered with the syphilitic rash.

Disease of the bones has been lately shown to be common in hereditary syphilis, and should be always looked for. In the long bones it may be easily detected by placing the finger and thumb one on each aspect of the bone, and passing the hand downwards along the shaft. If diseased, the lower end of the bone is felt to be abnormally thick, and this thickening is best marked at the point of junction of the shaft with the epiphysis. The disease, when it occurs, occurs as an early symptom, and is said always to be present in dead syphilitic children, whether stillborn or not. It is never confined to a single bone, and usually attacks several. The bone which least often escapes is the femur, and then follow in order of frequency, the humerus, tibia, ulna, radius, fibula, the bones of the skull, the ribs, ileum, scapula, clavicle, os calcis, astragalus, metatarsal and metacarpal bones. Sometimes, notably in a case recorded by Köbner, the bone affection is the only evidence of the hereditary disease. The various lesions of bone are described in treating of the morbid anatomy of the disease.

In severe cases suppuration takes place outside the joint, and the epiphysis separates from the shaft. The child then presents very characteristic symptoms. There is complete immobility of the limbs, as if the bones had been fractured. The arms lie pronated by the side of the body; the legs are stretched out straight in the cot, and, when the child is lifted up, hang loose, swaying from side to side. On examination, crepitation can be sometimes produced between the shaft of the bone and the epiphysis. The joints are very tender to pressure, and if an abscess forms, become bent and stiff and exquisitely painful.

Besides this disease of the articular ends of the bones, nodes may be present in the shafts of the long bones, giving rise to much tenderness and aching pain. Indurated deposits are also often found in the areolar tissue, tendons, and muscles.

Enlargement of the posterior cervical glands is also a common lesion. In most cases of infantile syphilis enlarged and movable glands may be felt in the nape of the neck, immediately below the occiput. Sometimes the lymphatic enlargement is more general, and the liver and spleen can also be felt to be increased in size. I used to be of opinion, with Dr. Gee, that the amount of splenic swelling could be taken as a measure of the severity of the cachexia. In other words, that it was only in the more severe cases that enlargement of the spleen took place at all, and that if the swelling was considerable the danger was great. I have met with cases, however, which show that the spleen may be large and hard although the general symptoms are mild and the nutrition of the patient satisfactory. Some time ago Dr. A. Leete Griffith sent me a well-nourished baby, aged four weeks, who had begun a fortnight previously to swell about the abdomen. The child's complexion was dingy. She snuffled a little and was slightly hoarse. A few scaly, coppery spots could be seen on the chin and in the left armpit. The veins of the epigastrium were full. The liver could be felt three fingers' breadths below the ribs: its consistence was soft. The spleen reached downwards for the same distance, and its substance was hard and resisting. There was no disease of bone. The mother had had sore-throat and rash at an early period of her pregnancy. The baby was being treated with anti-syphilitic remedies. Four months afterwards Dr. Griffith wrote to me that the spleen had become greatly reduced in size, and that the child was going on well. She was being brought up at the breast.

In this case the increase in size of the liver was probably not a consequence of the constitutional disease, for the substance of the organ was normal in consistence, and presented no sign of induration. The spleen, however, was large and hard, but still the cachexia could not be called severe, for the symptoms generally were exceptionally mild. Nutrition was good, eruption was scanty, and the condition of the child was never such as to excite anxiety.

The general condition of the infant varies, not according to the severity of any particular symptom, but according to the intensity of the general cachexia. The child sometimes continues plump, and although pale and rather weak, seems to suffer comparatively little from the effects of the disease. In other cases he wastes and becomes very feeble; his face, owing to the inelasticity of the skin, becomes wrinkled like that of an old man; he is peevish and cries constantly, never seeming to rest night nor day. His difficulty in taking the breast increases his irritability, and the consequent want of nourishment, his weakness. He dwindles rapidly; vomiting or diarrhœa may come on to increase his prostration, and he dies either suddenly from syncope or slowly from exhaustion.

A peculiar form of paralysis has been occasionally met with. It affects the anterior branches of the brachial plexus, and causes more or less complete motor paralysis of the upper extremities; the sensibility and temperature remaining normal. In two cases of this affection noted by Henoch, the upper extremities were almost completely paralyzed, the flexor muscles of the fingers alone retaining a slight trace of contractility. Other signs of syphilis were present. The paralysis soon disappeared under the influence of specific treatment. In some of these cases a peculiar twisting of the head backwards has been noticed when the child has been placed in a sitting position.

In rare cases the symptoms of hereditary syphilis are delayed until the seventh, ninth, tenth, or even fourteenth year. Coppery, scaly eruptions may then appear, with discharges from the ears, nose, &c. Chronic interstitial keratitis may also occur at these times, and is symptomatic of hereditary syphilis. There may also be deafness from some morbid condition of the auditory nerves. A peculiar malformation of the teeth is sometimes found, for our knowledge of which we are indebted to Mr. Hutchinson. This malformation affects only the permanent teeth, and is usually limited to the upper incisors. The upper central incisors are narrow and short. On account of this dwarfing they do not touch, and spaces are consequently left in the gum on each side. At the same time the edges are uneven from atrophy of the middle lobe, so that a broad, vertical notch is thus left in the centre of the edge, from which a shallow furrow or groove may pass backwards on both anterior and posterior surfaces nearly to the gum. The notching is usually symmetrical, but not always, for sometimes only one tooth is affected.

These symptoms may be found, not only when the disease is thus deferred, but also when it has appeared at the ordinary time during infancy. They constitute the tertiary stage.

Relapses are very liable to occur in children after the cessation of all symptoms, and when the disease is supposed to be cured. Probably many of the cases of so-called delayed syphilis are merely instances of relapse, the earlier symptoms of the disease having been unnoticed or misapprehended. When the relapse takes place at an early period it is most commonly observed in the form of mucous patches with large thickened elevated edges seated by the side of the anus, at the angle of the mouth, on the tongue, or between the fingers and toes. These may be combined with a return of the eruption on the skin. In cases where the disease reappears after an interval of years it usually manifests itself by more deep-seated lesions, such as are considered characteristic of the later or third stage: chronic interstitial keratitis occurs; the permanent incisors appear notched and dwarfed; there is deafness and more or less serious disease of bone. The following case, seen by the writer, under the care of Dr. Semple, at the Throat Hospital, affords a good illustration of relapsed syphilis:—

A girl, aged eighteen, suffering from chronic interstitial keratitis of one eye, applied for advice on account of "sore-throat." On examination of the fauces extensive ulcerative disease was discovered, which had destroyed the whole of the soft palate, and the greater part of the bony roof of the mouth. The teeth were not notched, nor were there any nodes on the shin bones. On inquiry it appeared that the mother had been a healthy woman before her marriage, but that after the birth of her first child she had begun to suffer from sore-throat, and to have an eruption on the skin. The child snuffled, was covered with a rash, and died after a few weeks. The six following children died in the same way. They were all born at the full time, and appeared to be healthy, but a few weeks after birth each began to snuffle; the characteristic rash appeared; and the infant wasted and died. The patient herself, although the eighth child, was the first who had survived. She had the ordinary symptoms of inherited syphilis soon after birth. At ten years old the eye became affected with keratitis. At the age of twelve she first began to complain of the affection of the throat, from which she had since been suffering.

This case is fortunately an exceptional one. As a rule the symptoms cease after a time and never return; nutrition goes on well, and the patient to all appearance is as strong as other children of his age. It may happen, however, that recovery is less complete, and although there may be no actual relapses signs may be noticed hinting at the past cachexia. Thus, nutrition is not quite satisfactory; the body is stunted; the complexion earthy; the hair thin and brittle. Traces of thickened bone may be found, and sometimes the brain suffers so that the child becomes imbecile or epileptic.

Morbid Anatomy.—Hereditary syphilis in the child produces very widely distributed lesions; indeed, there is no part of the body which may not become affected as a consequence of this diathetic disease. The principal lesions are seated in the bones, the mucous membranes, and the solid internal organs.

Syphilitic affections of the bones, our knowledge of which is of comparatively recent date, have been made the subject of careful study; and it is to Drs. Parrot and Cornil of Paris and Taylor of New York that we are chiefly indebted for complete descriptions of these important lesions.

The long bones become affected by a special suppurative osteochondritis which attacks the epiphysial end of the bone.

First, the layer of cartilage which is preparing for ossification increases in width so as to be twice or even four times its natural thickness, and becomes particularly transparent and soft. This increased thickness is due to a multiplication of the cartilage cells, which lose their natural characters and assume much the shape and size of the round granulation cells of syphilitic gummata. At the same time the intercellular substance is diminished. The layer of cartilage which is actually undergoing ossification, instead of being very thin, as it is in healthy bone, is thickened unevenly, so that it shows on section as a broad uneven line. By the microscope, its ostioblasts are found to be replaced more or less completely by small granulation cells or spindle-shaped elements. The already ossified bone immediately in contact with the last layer is altered in colour on the surface, being marked with patches of white or yellow or grey splashed with rose.

After a time destructive changes set in in the bony tissue. Parrot describes a "gelatiniform softening" in which the bone is replaced by a soft, rather transparent material of a yellowish or brown colour. When this dries, after death, or exposure of the bone to the air, a cavity is left. A puriform matter, too, sometimes infiltrates the cancellous structure, so that the canullæ disappear, and leave cavities filled with the pus-like substance. The result of this lesion is to produce separation of the epiphysis with the ossifying layer from the shaft of the bone. This is followed by suppuration round the affected part, but the joint itself is not involved. Under the microscope, the puriform matter is seen to consist, not of true pus, but of small angular but still roundish elements which replace the natural lymphoid and myeloid cells.

Another form of bone lesion, which Parrot has called "periosteogenesis," begins as a periostitis, and attacks principally the humerus and tibia. Parrot has described two forms:—the osteoid, which may begin at the earliest period of life, and the spongioid or rachitic, which is seldom met with before the age of six months.

In the first—the osteoid form—a new osteoid growth forms on the surface of the shaft, beneath the periosteum, which is thickened and adherent to it. The new growth is white and chalky in appearance from infiltration of calcareous salts: and by its colour is readily distinguishable from the bone beneath. It is composed of interlacing trabeculæ, lying perpendicularly to the axis of the shaft, and in place of the bone corpuscles, which in normal osseous tissue are disposed regularly around the Haversian canals, contains many-sided stellate corpuscles which anastomose by their processes with the cells of the periosteum and with one another.

The spongioid form consists of fibrous tissue, grey or yellowish in colour, and very vascular.

These two forms of new growth may be combined in the same subject, lying in alternate layers. The bone beneath is either unaltered in structure, or is more porous and brittle than in the normal state from absorption of calcareous matter and the formation of furrows filled with medulla.

The bones of the skull may be attacked by both forms of the disease. Gelatiniform softening is, however, comparatively rare in this situation, and when present (which is only in the youngest infants) rarely penetrates deeply into the bone. The osteoid growths are more common, and attack the older children. These lesions occupy the frontal, parietal, and occipital bones; but are especially frequent in the parietal in the neighbourhood of the anterior fontanelle. The deformity which results is a very characteristic one. Four elevations intersected by two furrows placed crosswise, are found, and a condition is produced which has been aptly compared to a "hot-cross bun." These osteophytes are thickened and porous, and the bones themselves may be lighter and more porous than natural.

Another lesion is sometimes seen which is similar to the cranio-tabes so common in rickety children. The bone is thinned in spots of varying size, and may even be perforated. This lesion is most common in the occipital bone, and is due to pressure as the child's head rests on the pillow.

Dr. Taylor of New York has described a syphilitic dactylitis which attacks the bones of the hands and feet. This affection begins in the fibrous tissue and produces a slight enlargement of one or more phalanges or an entire digit. It excites little pain, but interferes to some extent with free movement of the joint. Another form sometimes occurs in which the disease originates in the bone and periosteum. This variety most often attacks the fingers. One or more of the phalanges becomes thickened and fusiform. If the swelling is injured the skin becomes swollen, red, and tense, and ulcerating, discharges a soft detritus mixed with pus. Limited necrosis may follow and lead to shortening of the finger. If not injured, the swelling tends to resolve without breach of surface.

The above described changes in the long bones may occur within a few weeks of birth, or even during intra-uterine life. The lesions of the cranial bones occur later than the others, and are comparatively rare under two years of age.

The mucous membranes of syphilitic children are very liable to catarrh, and may be the seat of mucous patches, erosions, and ulcers. These lesions are often found on the inside of the cheek, lips, and fauces; but are rare at the back of the pharynx, and, according to Dr. John Mackenzie, never spread into the gullet. Sometimes, however, they are found in the intestine. Mucous patches and ulcers also occur on the mucous membrane lining the air-passages. In fatal cases they may be seen on the epiglottis and sides of the glottis, and sometimes extend into the larger air-tubes. In some cases the vocal cords are destroyed by ulceration; in others, they are the seat of warty growths.

In the *internal organs* new fibroid growths appear, which may be diffused or circumscribed. In the lungs many different pathological conditions have been enumerated as dependent upon a syphilitic taint—so many, that in all probability sufficient care has not always been taken to discriminate between pulmonary disease occurring in a syphilitic infant and real syphilitic disease of the lung. A syphilitic pneumonia has been described in which the lung becomes the seat of a grey consolidation, which on section presents a smooth shining surface traversed by fine fibrous lines. It is very dense and tough. Under the microscope the alveolar walls are seen to be infiltrated with round cells, spindle cells, and fibrous tissue. This change is no doubt met with occasionally in syphilitic children, but that it is peculiar to subjects of this disease has yet to be proved.

The new formation called "gumma" is universally recognized as a consequence of syphilis. In the lung gummata are seen as rounded masses, usually of the size of a nut, and yellowish-white in colour. Their consistence is firm at the circumference, but in the centre they are softer, and the interior is sometimes broken down into a small cavity containing puriform matter. Microscopic examination shows the alveolar walls at the circumference of the tumour to be infiltrated with nucleated cells which cause more or less compression of the alveoli. Nearer the centre round or oval cells are seen in a finely reticulated tissue. The central portion, if softened, consists of fatty molecular granules.

The *liver* is hypertrophied and indurated, either generally or partially, the enlargement being sometimes confined to one lobe, or to a part of one lobe. Specific disease of the liver, when it occurs, is one of the earliest signs of the cachexia, and usually causes death in a few days. The symptoms which mark its presence are —besides the enlargement—pain in the belly, shown by moaning and uneasy movements of the limbs, vomiting, and diarrhœa, or constipation. The abdomen is tympanitic and tender on pressure ; the pulse quick and small ; the expression of the countenance is altered, and the features look pinched and drawn. There is rarely any jaundice. Sometimes the pressure of the enlarged liver upon the vena cava may produce extensive œdema of the lower limbs, and of the scrotum. This was seen by the author in a case in which the syphilitic symptoms appeared a fortnight after birth. There was obstinate constipation, and vomiting, and the mucous membrane of the mouth was covered with thrush. The heart and lungs were healthy. The infant rapidly sank and died. Gubler, who drew attention to this condition of the liver as a result of syphilis, describes the organ in highly-marked cases as hypertrophied, globular, hard, and elastic. It is extremely resistant to pressure, and creaks under the knife when cut into. On section the natural appearance of the surface is seen to be quite lost, and in its stead we see layers of small, white, opaque grains on a yellowish uniform ground. No blood, but only a little yellowish serum, escapes on pressure. The capillary vessels are obliterated, and the calibre of the larger vessels is considerably diminished. These changes are due to the development of large quantities of fibro-plastic tissue, which compresses the hepatic cells, obliterates the vessels, and consequently prevents the secretion of bile in the parts so affected. Sometimes the disease is confined to circumscribed deposits (gummata) embedded in the substance of the organ, which is otherwise healthy. These masses are bright yellow, and present under the microscope the usual round or oval cells. There is commonly more or less degeneration and softening in the centre, while at the circumference the normal hepatic cells, between which the infiltration is advancing, become hypertrophied.

Local peritonitis often accompanies this condition of liver. Whether it is a consequence of the induration, or may occur independently of the hepatic lesion, is a question which remains undecided.

In the spleen the enlargement consists principally of a diffused interstitial hyperplasia.

Changes have also been observed in the heart and kidneys. These organs, even when healthy to the naked eye, are sometimes found, on closer examination, to be undergoing interstitial changes. In some specimens produced by Dr. Coupland, before the Pathological Society, the heart showed, under the microscope, an almost universal infiltration of small round cells amongst the muscular fibres, and the kidneys, although presenting to the naked eye a normal appearance, were found to be undergoing similar changes.

Huber has found the supra-renal capsules affected in some cases. In one well-marked example the capsules were large, greyish on the outside, translucent and thick, with numerous white, irregularly-shaped spots interspersed in the capsular substance. At the posterior surface of both capsules were irregular yellow thick knots, showing, under the microscope, fatty detritus.

These affections of the internal organs do not seem to stand in any direct relation to the general symptoms. In cases where the latter are very severe, and the influence of the disease upon nutrition is most powerfully manifested, the liver and spleen may present no sign of pathological change. In other cases, again, these organs may suffer severely, while the external characters of the disease are but faintly marked.

Diagnosis.—In a well-marked case of inherited syphilis, the wizened face, the snuffling, the peculiar complexion, the hoarse cry, the emaciation, the dry and parchment-like skin, with the characteristic eruption scattered over the surface, the fissured lips and anus, form a collection of symptoms which when once seen it is impossible afterwards to mistake. We, however, constantly find cases in which many of the symptoms are absent. The child may continue plump, and be apparently in good condition; but here there is usually snuffling; rust-coloured spots are found about the perinæum, and fissures will be seen radiating from the anus, and perhaps from the corners of the mouth. The general pallor of the skin is seldom absent, although the special "*café-au-lait*" tint of the complexion may not be noticed. The deep purple tint produced by a collection of ecthymatous pustules, presents a very characteristic appearance, and one which it is difficult to mistake, especially when it is combined with the cracks and ulcerations about the anus, &c. The appearance alone of ecthyma in an infant should lead us to suspect syphilis. Scabies is the only other cause which is found to produce such pustules at this early age, and this is at once detected by the absence of the other signs of syphilis, by the fewer number of the pustules, and by the presence of the characteristic furrow peculiar to the acarus. Sometimes snuffling is the only symptom which marks the existence of syphilis. In these cases the diagnosis is more uncertain, but a careful examination will often detect a few—perhaps only one or two—rusty spots about the body; if not, and the snuffling continues two or three weeks, specific treatment should be always had recourse to, for obstinate coryza is commonly due to a syphilitic taint.

If in doubt in any case, after a careful examination of the child's whole body, we should inquire into the health of the other children, examine them for signs of past disease, and question the parents as to their own health, especially as to the occurrence of previous miscarriages on the part of the mother.

When the cachexia has been pronounced, its consequences remain visible long after the disease has passed away. The physical development of the child is imperfect, and often his complexion is ashy or earthy in tint. Vestiges of local disease may be noticed, such as flattened bridge of the nose from long continued swelling of the nasal mucous membrane when the bones are soft; markings of the skin by little pits, or linear cicatrices, from former ulceration, especially about the angles of the mouth; protuberant forehead from specific disease of the frontal bone, and the characteristic thickening of the cranial bones around the anterior fontanelle. Cranio-tabes alone is no indication of syphilis, as it may occur quite independently of any specific taint. There may be interstitial keratitis of the eye, notching and dwarfing of the permanent teeth, and even deafness from disease of the auditory nerve. Often, too, the spleen is left swollen and hard.

Causes.—The disease may be transmitted from parents to children through the influence of either the father or the mother. In the child the degree of severity of the inherited taint is in proportion to the shortness of the time which has elapsed since the appearance of the primary symptoms in the parent; but whatever be the stage which the disease has reached in the parent, the child invariably exhibits secondary symptoms of the skin and mucous membranes.

The father alone may be suffering from the disease, and it is stated by some authorities that he may impart the taint to the child, without at the same time infecting the mother. Dr. Kassowitz, physician to the Institute for Sick Children, Vienna, has made laborious investigations into this question. Out of seventy-six cases of inherited syphilis, with regard to which the information obtained had been sufficiently accurate to exclude every source of fallacy, the mothers were found to be healthy in forty-three. The fact of this exemption from disease was ascertained by examination of the skin, the throat, the hair, the glandular system, and of the bones most commonly affected by the virus, and was established by careful watching extending over many years. Moreover, in many cases, indirect evidence pointing to the same end, was furnished by the stage which the disease had reached in the husband at the time of marriage, he being no longer capable of directly infecting his wife. Dr. Kassowitz denies the possibility of infection of a healthy mother through a tainted ovum; or, on the other hand, of a healthy fœtus, in cases where the mother has contracted the disease after conception. He maintains that if a diseased ovum were capable of infecting a healthy mother infection would happen in every case; and brings forward evidence to show that the syphilitic poison, unlike many others, cannot pass from the fœtal to the maternal vessels, nor from the maternal to the fœtal. This is attributed to the fact, that the poison is carried in the formed elements of the blood, for the serum has been proved to be incapable of communicating the contagion. Therefore, according to this observer, if the mother escape direct infection by the father of the child, she may bear syphilitic offspring without herself falling a victim to the disease. It is only right, however, to state that in forming this conclusion, Dr. Kassowitz runs counter to the opinions of many eminent observers. Colles pointed out in 1837, that "a new-born child affected with congenital syphilis, even although it may have symptoms in the mouth, never causes ulceration of the breast which it sucks, if it be the mother who suckles it, although continuing capable of infecting a strange nurse." This immunity of the mother is difficult to explain on any other assumption than that she is herself a subject of the disease; but the difficulty cannot be held to confirm the theory of infection of the mother by the ovum in face of positive data to the contrary.

The mother alone may be syphilitic. These cases occur where a widow, infected by her deceased husband, marries in second nuptials a healthy man, and bears a diseased child; or where a healthy woman, married to a healthy man, suckles a syphilitic child, contracts the disease from it, and at her next confinement bears a syphilitic child.

In cases where the father alone, or the mother alone, is syphilitic, the child is sometimes found to escape contamination, and to be born free from the disease. Where, however, both parents are infected, the infant's chances of escape become very much lessened, and he usually suffers severely from the inherited taint.

In the case of twins born of parents the subject of this disease, the two children are not necessarily affected to an equal degree. Thus "Minnie H.—aged three months, very much emaciated, being, according to the mother's account, smaller than at birth. Snuffles, and has snuffled since she was born. Skin shrivelled and parchment-like, covered with pemphigus." Under treatment, the spots disappeared, and the child at first seemed improving, but she afterwards sank, and died, having persistently wasted since birth.

The second twin was seen on the day the first died. "A very healthy-looking child, with good complexion, fat and vigorous. She has snuffled since birth, and on the buttocks are seen stains left by recent eruption. Was never thought sufficiently ill to require medical advice."

These two cases of twins suffering from the same hereditary disease are very interesting, as showing that the amount of disease inherited by the fœtus in the womb is not determined solely by the amount of disease from which the parents may be suffering at the time. Some other causes must also operate. In the case of twins born of healthy parents, we often find one to be more vigorous than the other, and it often happens that one will sink and die while the other remains strong and robust. So in the case of the inheritance of a constitutional disease, if the twins are, while in the womb, of unequal vigour, the one drawing to itself a greater proportion of nutritive material than the other, the less vigorous fœtus would no doubt have a less degree of resisting power, and would suffer to a greater extent than the other from the effects of a poison to which both are equally exposed.

When the child is born perfectly healthy, he may still be infected after birth. He may contract the disease during lactation, the nipple of the mother or nurse having become the seat of a syphilitic sore from contact with the mouth of another child who is suffering from the disease. Whether the milk of a syphilitic woman is capable alone of communicating the disease to a healthy child is open to very considerable doubt. Again, accidental contact with purulent matter from a chancre, or with discharges from a secondary sore, may inoculate the child; but whether the inoculating matter be primary or secondary, the sore thus produced in the child is always primary.

With regard to the possibility of syphilitic inoculation by vaccination, which was long denied, there is no doubt from authentic cases which have been published, that infection by this means may occasionally take place. Every case, however, in which the symptoms appear after vaccination must not be necessarily attributed to inoculation by tainted lymph. The first manifestation of the latent disease may be determined by anything which sets up a temporary febrile disturbance, and vaccination, therefore, may, like other things, be the stimulus exciting the outbreak of previously existing disease.

Direct inoculation by a primary sore in the vagina during delivery, although possible, is not probable, and no well-authenticated instance of such inoculation having occurred has been recorded.

Prognosis.—Indications derived from observation of the parents.—As a rule prognosis becomes more favourable with each succeeding pregnancy, the tendency of the poison being to become less and less noxious as years pass by. This rule, however, is not absolute. Cases occasionally occur where the opposite conditions are found. Thus, a man who has contracted the disease before marriage, and has undergone suitable treatment, may at first beget a perfectly healthy child. Afterwards, however, although no fresh symptoms have appeared in the interval, he may beget other children who are syphilitic. There is no doubt that mercurial treatment has the power of rendering the poison of syphilis inactive for a time, and that in cases where the virus is still unexhausted it may lie dormant until time has lessened the influence of the remedy. Such cases are, however, exceptional and rare. If we have noticed a gradual improvement in successive pregnancies, so that a woman who had borne children—at first prematurely, then stillborn at the full time, afterwards living but diseased, bears a child who has at first the appearance of health, we may reasonably infer that the poison is wearing itself out, and that each succeeding infant has a better chance than its predecessor of outliving the disease. As a rule, the longer the time which elapses between the birth of a child and the appearance of the first symptoms the greater is the likelihood of his recovery. When the symptoms appear during the first two weeks of life the disease is almost always fatal.

Indications derived from observation of the child.—It is to the intensity of the general cachexia, and not to the severity of any particular symptom, that we must look in order to estimate the amount of danger in each case. The prognosis is serious in proportion to the degree to which nutrition is interfered with, and therefore anything which tends to increase this defect in nutrition tends greatly to increase the gravity of the case. Thus vomiting and diarrhœa add their own enfeebling effects to the general weakening influence of the original disease, and, where they occur, must be looked upon as very serious complications.

There is, however, one special symptom which it is very important to take into consideration in forming a prognosis, as it may indirectly produce very serious results. This is the condition of the nasal passages. These passages may become completely blocked up, partly by the swelling of the Schneiderian membrane, partly by the caking of the crusts formed by the dried discharge. Two dangers may arise from this source. As air can no longer pass through the nose, the mouth becomes the only channel by which air can be admitted into the lungs. It is therefore required for respiration, and cannot be spared for any other purpose. The child is consequently prevented almost entirely from taking nourishment, for while he sucks respiration has necessarily to be suspended. He can only take the breast by short snatches, and the amount of milk he receives is very inadequate to his wants. The danger of starvation is thus added to the other dangers of the case, and may exercise a very unfavourable influence upon the termination of the disease. A second danger resulting from the condition of the nose is that arising from absorption of the noxious gases produced by decomposition of the pent up pus. Septicæmia may occur in this way.

On the whole, we may conclude that if nutrition appears to be well performed, *i.e.*, if the child continues plump, or does not sensibly emaciate, the prognosis is favourable. If he wastes, the prognosis is highly unfavourable.

Prevention.—When a child is born suffering from syphilis, measures should always be adopted to prevent succeeding children from falling victims to the same disease. One or both parents should be subjected to suitable treatment, which should be continued sufficiently long to render it probable that the next child will escape the effects of the virus. Even if a second pregnancy have already occurred before any treatment is adopted, we should still not despair, for cases are recorded which show that very favourable results may be obtained by this means. It is important, however, that the treatment be begun as early as possible, and be continued, if it can be borne, for three full months.

Treatment.—In the treatment of syphilitic children we have two objects. We have to destroy the cachexia which is weighing upon the child, and we have to sustain, and if possible to improve, the general nutrition of the body. The second of these objects is to some extent effected by the same means which accomplishes the first. As the intensity of the cachexia diminishes, nutrition usually improves in equal proportion; and, therefore, in the milder cases a child is often found, as the symptoms disappear, to become strong and healthy under no other treatment than that required for attacking the transmitted taint. In the severer cases, however, nutrition is so lowered that after the cause of the mal-nutrition has been removed, special means must be adopted to neutralize its effects.

Treatment must be begun directly any symptoms appear to indicate the disease from which the infant is suffering. If the previous children have been syphilitic, and the parents in the interval have been subject to no treatment, the child should at once be placed under the influence of remedies, even although he may at the time present no symptoms of the disease, for it is of the highest importance that treatment should commence before the cachexia has produced any marked impairment of the nutrition of the body. If the parents have undergone treatment in the interval, a careful watch should be kept over the infant, and the first sign of the disease should be the signal for active interference.

Whatever opinions may be held with regard to the mercurial or non-mercurial treatment of syphilis in the adult, in the child there is not so much room for hesitation. As the danger of the disease lies in the intensity of the cachexia—as the prognosis is favourable in proportion to the time which has elapsed before the appearance of the first symptoms—a remedy which has the effect of weakening the power of the cachexia, and therefore of delaying the outbreak of the symptoms, is not one to be lightly disregarded. Such delay may make all the difference between death and recovery, for to retard the appearance of the symptoms is in many cases to save the life of the child. A non-mercurial treatment is still, however, advocated by some writers; such treatment consisting in the administration of chlorate of potash with dilute hydrochloric acid and of cod's liver oil; in attention to diet and cleanliness, and in ensuring a plentiful supply of fresh air—in endeavouring, in fact, without special treatment to counteract the depressing influence of the cachexia upon nutrition, and by invigorating as much as possible the strength of the system to enable it to overpower the constitutional poison, and prevent this from manifesting its existence. Such treatment, when the taint is comparatively weak, is no doubt frequently successful. The disease is for the time kept under, and in every recurrence of the symptoms the danger is tided over by the same means. Cases, however, occur where this plan is quite ineffectual; and in severe cases, where the contamination of the system is profound, and the danger to life imminent, it is surely unwise to neglect an agent which has so marked an influence on the disease. The power of the mineral over the cachexia is conclusively proved, as Diday points out, by its influence upon the mother during pregnancy. She is enabled by this means to bear a healthy child, although all her previous children may have been deeply infected. Moreover, the rapidity with which syphilitic symptoms in the child will disappear under its use must be familiar to every one accustomed to infantile disease.

The child may be treated indirectly through the mother, or by the administration of remedies directly to himself. If the mother is suckling her infant, the first method is valuable as offering a suitable means for the simultaneous treatment of both mother and child. For the infant, too, it has this special advantage, that treatment by the medicated milk is less likely to cause irritation of his digestive organs,—an occurrence of all things to be avoided. Besides, the remedy reaching the stomach in frequent small doses, and at a time when that organ is actively employed in the work of digestion, finds at once ready admission into the system. M. Bouchut urges the employment of the method in all cases as the most efficient and the safest way of treating the disease. In mild cases this mode of treatment may, perhaps, be sufficient to effect a cure, but more commonly we find it necessary in addition to give mercury to the child. It often happens that the secretion of milk in the diseased mother is so scanty, and so poor in quality, that the amount of the drug which reaches the infant by this means is quite insufficient to produce any marked result; and in those cases where the child is much emaciated, and where it is important to bring him as rapidly as possible under the influence of the remedy, it is of comparatively little value unless aided by the direct method of treatment.

In giving mercury directly to the child, the preparation which is most commonly employed in this country is the ordinary hydrargyrum cum cretâ. Of this, one grain may be given at first every morning and evening. After the first week the dose should be gradually increased every three days by a quarter of a grain at a time, until two grains are taken twice a day. To prevent any irritating action on the alimentary canal, a grain of carbonate of potash, or a few grains of prepared chalk, may be added to each dose. If, in spite of this addition, any disturbance of the stomach or bowels be excited by the drug, the remedy should be omitted for a day or two until this derangement has subsided: it must then be recommenced. Should the disturbance return, the grey powder must be changed for one of the other preparations of mercury. A solution of corrosive sublimate is a very convenient form in which to administer the remedy, and if given in suitable doses does not appear to exercise any specially irritating influence upon the gastric mucous membrane. Most infants will take half a drachm of the pharmacopœia solution without inconvenience three times in the day. It may be sweetened with syrup. After the first week the quantity given should be gradually increased, if the medicine is well borne. Calomel in doses of from one-twelfth to one-sixth of a grain is sometimes employed, and where vomiting has been excited by the other preparations, is occasionally effectual in calming the irritability of the stomach; but it is itself liable to be attended with diarrhœa, and can seldom be continued long without this danger.

Besides being given by the mouth, mercury may be also employed externally, so as to be absorbed by the skin, and this method forms a useful addition to the other modes of treatment. In cases where the internal use of mercury causes great disturbance, very valuable results are often obtained by this means, which allows of the treatment being continued while time is given for the irritation of the alimentary canal to subside. Still, mercurial frictions and baths do not always act as safeguards against gastro-intestinal derangements. The frictions are made with unguentum hydrargyri, half a drachm of which is rubbed into the sides of the chest once a day; or a flannel band smeared with the ointment may be applied round the chest or belly. At the same time great cleanliness must be observed; each morning the surface of the body should be well washed with soap and warm water, so that all the old ointment may be removed before a fresh application is made. For the baths, corrosive sublimate is used, each bath containing half a drachm of the salt. This quantity may be gradually increased, by fifteen grains at a time, to a drachm, or a drachm and a half. The baths should be used every two, three, or four days, unless erythema be produced by their employment, when the quantity of the sublimate should be reduced, or the interval between successive baths should be increased. Besides the effect upon the system produced by the absorption of the mercurial salt, the baths are also beneficial by their local action upon the cutaneous lesions.

Of the different ways of treating the disease thus described, we must employ one or another, or several together, according to the condition of the infant. The more intense the cachexia—*i.e.*, the more complete the hindrance to nutrition—the more important does it become to bring the system as quickly as possible under the influence of the drug; but unfortunately it is in these cases that the susceptibility of the stomach and bowels to the irritating action of remedies reaches its height. Here, then, the external plan of treatment becomes of extreme importance, and it must be aided by the cautious administration of mercury by the mouth, changing from one preparation to another as circumstances seem to require it.

At the same time, every effort must be made to improve general nutrition. The feeding of the infant is a point of extreme importance, and the quality of his food must be regulated with the utmost care. Weakened as he is by his constitutional complaint, the child's digestive power is small. If possible, therefore, he should be brought up at the breast; but, unfortunately, the disease is one in which we are too often deprived of this resource. A wet-nurse cannot be employed on account of the danger to a healthy woman of becoming herself infected by contagious sores in the mouth of her nursling. The mother runs no such risk, but her milk is usually scanty or poor. Still, she should be urged to make every effort to nurse her infant, for in his unhealthy state it is better that he be partially suckled than brought up entirely by hand. Whether or not he is to rely solely for his nourishment upon his mother's breast depends upon the satisfying qualities of her milk. The child must be carefully watched, and if he seem discontented after taking the breast, require to be nursed often and show frequent signs of hunger, it will be necessary to make some addition to his food. The breast should be then limited to two meals a day, and in the interval the diet can be regulated in accordance with the rules laid down for such cases (See Chapter XI., Diet 3). When the breast-milk is thus supplemented by hand-feeding in a delicate child, we must remember that variety in the food is an aid to digestion which it would be injudicious to disregard.

Cod's liver oil is often of great service in these cases. Five or ten drops may be given two or three times a day, in a spoonful of the milk and lime-water, and if this is well borne, the quantity may be gradually increased by a drop or two at a time. If, however, it causes sickness or uneasiness it must be stopped at once, to be returned to after a few days, and in smaller doses. If any of the oil appears unchanged in the stools the quantity must be reduced. Should the skin generally be healthy, inunction of the oil may also be made use of, a teaspoonful being rubbed into the chest once or twice a day. If the skin is covered by the syphilitic eruptions, the frictions should not be used until these have disappeared. The child must be kept in an equable temperature of from 60° to 65° Fahr., partly in order to avoid the risk of cold, to which he is particularly susceptible while under the influence of mercury; partly on account of the beneficial influence upon the disease of a moderately high temperature, for all writers upon this subject unite in recommending warmth as an important aid to the other treatment.

The utmost cleanliness must be observed. After taking food the mouth should be carefully washed out with a piece of linen rag dipped in warm water, to prevent any accumulation of milk round the gums and cheeks — a fruitful source of thrush. The napkins must be changed frequently, and the buttocks be carefully sponged and dried after each action of the bowels, for all unnecessary irritation of the skin must be avoided, and the continued contact of the urine and stools with the skin promotes the occurrence of the specific erythema. Besides, cleanliness is important in promoting the healing of mucous patches and other syphilitic sores about the anus. For the same reason the whole body should be bathed, at least once a day, with warm water, care being taken to dry the child thoroughly after each ablution.

If vomiting occur, the internal use of mercury must be suspended; and should the gastric disturbance still continue, the child's nourishment must be limited to his mother's milk. If the vomiting does not subside by this means, all food must be forbidden, and the child be allowed nothing but cold barley-water, given at intervals with a teaspoon. These measures usually succeed in arresting the vomiting, and, in most cases, the mere suspension of the mercury is sufficient to produce this result. Should it, however, continue, a hot linseed-meal poultice must be applied to the epigastrium, and a powder containing one-sixth of a grain of calomel, with a few grains of powdered chalk, must be given every four hours; or a mixture containing five grains of bicarbonate of soda to a teaspoonful of infusion of calumba may be ordered three times a day. When the vomiting is obstinate, the case becomes one of great danger.

Diarrhœa is best treated by suspending the mercurial, and if this is not followed by stoppage of the disorder, a mixture of chalk and catechu, with aromatic confection, is usually sufficient to restore the bowels to their natural condition. Diarrhœa is seldom obstinate in this disease if the directions already given as to diet, and avoidance of cold, have been properly attended to.

In cases where either of these symptoms has occurred, great caution is necessary in returning to the specific treatment, giving the mercury in smaller doses, and assisting it by the external application of that drug, either in the form of baths or ointment.

Local applications are useful as aids to the specific treatment in furthering the disappearance of the local lesions. It is important to remove these local symptoms as quickly as may be, for although many of them do not sensibly affect the prognosis, yet others, as the condition of the nose, may exercise an unfavourable influence on the termination of the disease. Besides, so long as there are contagious sores upon the body of the child, his attendants are liable to become infected by direct contagion, and this danger should be removed as promptly as possible. In the third place, a healthy skin is indispensable to the successful employment of frictions, either with the mercurial ointment or with cod's liver oil.

The baths of corrosive sublimate have, as has already been stated, a very favourable influence upon the cutaneous lesions, but there are other special applications which may be made use of in treating these affections.

When the nostrils become blocked up by hard crusts, these latter should be gently removed, after being softened by warm water and cold cream. When the internal surface is thus laid bare, a little mercurial ointment may be gently applied to the mucous membrane lining the nostrils with a feather, or with a piece of linen rag rolled up into the form of a slender cylinder. Diday recommends for this purpose an ointment composed of two or four grains of calomel to the drachm of lard.

Large crusts formed on the body should be removed by covering them with a thick layer of lard, and laying over this a hot bread-and-water poultice. This should be applied at night, and in the morning the softened scab can be easily detached, and the ulcer, when exposed, must be touched with the solid nitrate of silver.

Mucous patches about the mouth or anus must be well touched with the same caustic. They must be kept very clean, as previously directed. Ricord orders the patches to be washed twice a day with a solution of chloride of soda, and after each washing a small quantity of calomel is to be applied with pressure.

Mercurial treatment must not be continued too long, for the prolonged administration of this drug to young children produces a condition of intense anæmia which often persists long after the remedy has been abandoned. It is better not to continue specific treatment after the symptoms have disappeared. Afterwards, it is advisable to give a tonic, as a mineral acid with bitter infusion, quinine, iron, cod's liver oil, &c. Iodide of iron is valuable in these cases, but it is best given, not in the form of the syrup, but by combining iodide of potassium with tartrate of iron in distilled water. This combination makes a perfectly clear solution, and is much preferred for children on account of the tendency of the pharmacopœia syrup to set up fermentation and give rise to acidity.

CHAPTER VI.

MUCOUS DISEASE.

MUCOUS DISEASE.—Character of the derangement.

Symptoms.—Loss of flesh, colour, and spirits—Restlessness at night—Somnambulism—Nocturnal incontinence of urine—Appearance of tongue—Bowels—Complexion—Skin—Lymphatic glands—Progression of symptoms—Bilious attacks—Worms a common complication.

Causes.—Previous diseases, especially whooping-cough—Second dentition.

Diagnosis.—Resemblance to chronic tuberculosis—Points of distinction—Temperature.

Treatment.—Diet—Farinaceous food bad—Dietary—Attention to skin—Warm clothing—Drugs—Alkalies to be preferred to acids—Aloes—Iron—Illustrative case—A change sometimes advisable to acid medicines—Alum—Bracing air.

MUCOUS disease, a very frequent disorder amongst children, may be met with at any age, but is most common between three or four and ten or twelve years. The derangement consists in an increased secretion of mucus from the whole internal surface of the alimentary canal: it is a mucous flux which interferes mechanically with digestion and absorption of the food, and by its influence in impeding general nutrition often excites suspicions of the existence of tubercle.

The Symptoms vary in intensity according to the degree to which nutrition is interfered with. At first they are usually slight, but become more severe as the derangement becomes more marked. Thus, the child gets languid and dull; he is disinclined to exertion, and complains of weariness and depression. He grows pale and loses flesh; his spirits are low; he ceases to take interest in his accustomed amusements, and sits listless and moody, sometimes crying without apparent cause. He is often drowsy in the day, but is restless at night, grinding his teeth; and his sleep is often disturbed by frightful dreams, from which he wakes in great terror, crying and talking incoherently. The conduct of the child at night is often extremely perplexing to his relatives. Sometimes he will start from his sleep with a loud cry, and will remain for a considerable time under the influence of the most violent panic, uttering wild exclamations, and being apparently unable to recognize the familiar faces of those who are endeavouring to soothe him. At other times he will rise from his bed still asleep, and will walk from room to room. In fact, most of the cases of somnambulism in children are due to this cause. Nocturnal incontinence of urine is also not unfrequently complained of, and this, although in the beginning only occasional, may afterwards become habitual.

Many other signs of nervous uneasiness may often be observed. As a rule, the child is excessively irritable and peevish. He is unreasonably exacting in the nursery, quarrels with his brothers and sisters, and may fall into violent fits of rage at the most trifling annoyance. His mother will say that he has become so naughty she "cannot think what has come to the child." In the worst cases other nervous derangements may occur, such as squinting and stammering. The latter symptom is usually found to vary in degree, according to the intensity of the general symptoms, and unless it have persisted sufficiently long to lead to an acquired habit, usually passes off as the derangement subsides.

The appetite, at first unusually keen, becomes gradually capricious, then fails almost entirely; and each meal is followed after some little interval by flatulence and uneasiness. The appetite may, however, remain large, even after the emaciation has become extreme, and in some cases the hunger seems almost insatiable, the child very shortly after a full meal asking again for food.

The tongue is generally flabby and indented at the edges by the teeth, but it has besides a peculiar appearance, which is very characteristic. This appearance is due to the mucus with which it is covered, for the glands of the mouth are as active in their secretion as those of the other parts of the alimentary canal. A glossy, slimy look is thus given to the organ, which is quite distinct from the moist appearance produced by saliva alone, and resembles more the aspect it would bear if brushed over with a solution of gum. This slimy look is not always general, but in slightly-marked cases is limited to a spot in the centre of the dorsum, the rest of the surface and the sides having the ordinary aspect. The tongue is either perfectly clean, or is covered with a thin coating of grey fur. The fungiform papillæ at the sides of the dorsum are also unusually distinct. They are seen as large round or oval spots, seldom elevated, and varying in colour from pale red to deep crimson; the depth of colour being in proportion to the degree of irritability of the digestive organs. If vomiting or diarrhœa supervene, their colour becomes bright red, and they then project slightly above the surface, peering through the thick coating of yellow fur with which the dorsum in such cases is usually covered. Sometimes a different appearance is presented, and the whole tongue is clean, with a glazed, glossy look as if entirely denuded of epithelium.

The bowels may act regularly or be more or less costive. In the latter case there is some straining at stool, and light-coloured, pasty motions are evacuated, mixed, perhaps, with strings or lumps of free mucus. Even when the stools do not contain mucus habitually, it is common for large quantities of the secretion to be brought away by the action of a mild aperient. Sometimes we find constipation and diarrhœa to alternate with one another. Thus, the bowels are obstinate for two or three days, or even for a whole week; a violent fit of purging then sets in, with ten, twelve, or even more stools in the twenty-four hours; after which, the accumulation having been discharged, the bowels become again confined.

There is often an unpleasant smell from the mouth of the child, probably due to catarrh of the oral mucous membrane, and decomposition of the mucus and epithelium. In some cases, however, it is evidently dependent upon enlarged tonsils, which secrete a thick, bad-smelling semi-purulent matter.

The colour of the face undergoes rapid changes. There is usually some discoloration under the eyes, but a characteristic symptom is sudden pallor, the child seeming as if about to faint. To use the nurse's expression, "He turns deadly white," and his ghastly appearance at this time often excites comment. Sometimes actual syncope occurs, for fainting fits are not an uncommon symptom of the derangement.

The complexion is often remarkably sallow, having a half-jaundiced tint; and this varies in degree from day to day, the colour being most dingy at the time when the nervous symptoms are most strongly marked. Thickness or muddiness of the complexion is often associated with acidity of urine and a free precipitation of urates. At these times, too, the child is apt to complain of headache, or of flatulent pains about the chest or belly. A stitch in the side is, indeed, a common source of annoyance. When asked to point out the seat of pain, the patient almost always places his hand over the left hypochondrium. It will be remembered that the large bowel at this spot makes a very abrupt bend, and the angle thus formed is a common seat for the accumulation of flatus.

Abdominal pains of a paroxysmal character are sometimes met with. These are seated about the umbilicus. They are apt to come on in the early morning, before rising from bed, and are sometimes excited by taking food. They do not, as a rule, cause any feeling of nausea; nor are they followed by looseness of the bowels; nor is there any tendency, as in ordinary colic, to seek relief by bending the body. If the pains are very severe, the child may be noticed to turn white.

In some children the skin ceases to act at a very early stage of the disease, and becomes rough and harsh, especially about the chest, arms, and belly. In extreme cases the whole body may be covered with little scales of epithelium which can be rubbed off as fine dust.

The lymphatic glands of the neck are liable to become enlarged on the slightest irritation. They do not, however, necessarily suppurate or remain permanently swollen. The enlargement, after persisting for a variable time, may disappear completely.

The temperature of the body is not raised. Often it is lowered, especially at the surface, and a prominent symptom is the extreme coldness of the hands and feet. It is curious that the patient himself usually seems unconscious of this peculiarity, or indifferent to its discomfort, and will declare that his feet are warm when examination shows them to be quite the contrary. Not seldom from morning to night, and even after the child has been put to bed, his feet remain in the same cold, clammy state.

The symptoms thus described do not proceed in any regular manner from bad to worse. It is usually found that the child is subject every few weeks to what are called "bilious attacks"—to violent attacks, that is, of vomiting and purging, lasting often for several days, during which large quantities of mucus are got rid of. The system being thus relieved, the symptoms become for a time less severe; the child sleeps better at night, and during the day is less languid, and more inclined to take exercise. The improvement is not, however, of long continuance; for the symptoms returning, grow gradually worse until they culminate in another violent attack like the former. In this way the child may go on for months, getting gradually thinner and weaker, his condition exciting the gravest apprehensions amongst his relatives, especially as a short hacking cough is a not unfrequent symptom of this disorder, and increases their fears of the outset of consumption. Examination of the lungs, however, in an uncomplicated case of mucous disease will reveal no signs of pulmonary mischief.

Worms, especially amongst the poorer classes, form a common complication of this derangement; in which case the symptoms are all attributed to the presence of the entozoa. The creatures find in the alkaline mucus a congenial nidus: but the disordered state of the mucous membrane is at least as important as are the parasites themselves; and until the alimentary canal is restored to a more healthy condition, special anthelmintics frequently fail of success. The difficulty so often experienced in curing a child of worms, is due to neglect of the measures necessary effectually to restrain this unnatural activity of the mucous glands. The subject of worms will, however, be more conveniently treated of in another chapter.

It is easy to understand how nutrition must suffer in this disease. The mucus poured out into the stomach and bowels seems to act as a ferment, and to cause decomposition of the food with which it comes into contact. The products of fermentation are gas and acid. The gaseous accumulations excite the abdominal pains and side-stitch which are the source of so many complaints. The acid finding its way into the circulation is distributed throughout the body, and by keeping the tissues in a state of continual irritation, is no doubt a cause of the unruliness of temper, the nocturnal excitability, and the excessive muscular restlessness which form such prominent features of the disorder. In the alimentary canal the excess of acid has a direct influence upon the digestion of food. It partially coagulates the mucus, so that the alimentary masses being coated more or less completely by thick slimy matter are not properly mixed up with the digestive fluids. A comparatively small part of the food which has been taken is therefore converted into a form in which it is capable of being absorbed; and of that small part a still smaller is actually taken up by the absorbent vessels, on account of the thick layer of viscid mucus which lines the walls of the bowel, and prevents the veins and the lacteals from performing their functions.

The large appetite so commonly found in these cases is, no doubt, in part, a manifestation of the want of nourishment felt throughout the system; but it is probably also, in part, a morbid craving excited by the stimulating action of the fermenting contents of the stomach and bowels.

Causes.—In children there is naturally great activity of the mucous membrane lining the alimentary canal. As compared with the adult its secretion appears in them to be always in excess, and a very slight irritation is sufficient to increase it. The stools of young infants are in their natural state composed in great part of mucus, and any passing irritation, such as a meal of indigestible food, or a slight chill, causes at once a marked increase of the secretion; the so-called *slimy* stools are then passed, consisting of thick viscid mucus, mixed up more or less intimately with the fæcal matter. In cases where the irritation is constantly renewed, as occurs in children who are habitually fed upon indigestible food, large quantities of mucus are passed, often coating the small fæcal masses, or appearing separately as strings and jelly-like lumps.

Certain diseases are apt to leave behind them this condition of the bowels; thus, measles and scarlatina may be sometimes followed by it. Whooping-cough is, however, of all diseases the one to which this derangement can most commonly be traced, and there is a special reason why this should be so. In whooping-cough the bronchial mucous membrane secretes a tough stringy mucus in very large quantities, and there is at the same time a copious mucous flux from the stomach and bowels. The abundant thick mucus which is vomited at the termination of the characteristic cough, comes in great part from the stomach; and the involuntary evacuations which are so frequently found to follow a paroxysm, contain much of the same secretion. The tongue in all severe cases of whooping-cough will be found to correspond exactly with the appearance of the organ described as characteristic of mucous disease; in fact, an acute attack of this intestinal derangement is a constant accompaniment of severe pertussis. As the whooping-cough lessens in severity, the derangement of the alimentary canal frequently subsides; but in many cases, especially if the child be weakly, or be much reduced by the intensity or the long continuance of the disease, the flux from the bowels continues and becomes a chronic condition. It is for this reason that whooping-cough is so much to be dreaded in weakly children. The disease not only interferes with nutrition while actually in progress, but also leaves behind it a chronic derangement of the bowels which often produces extreme emaciation, and may favour the occurrence of very serious complications.

An explanation of the persistence of the digestive trouble is, I believe, to be found in the extreme susceptibility of the subjects of mucous disease to alternations of temperature. With hands and feet habitually cold, a child can have little power of resisting the effects of chill; and, indeed, I have often noticed that any sudden change of weather, or the mere going out with cold feet into a raw air, has been followed by a return of the worst symptoms of the complaint. Owing to these slight but repeated chills, the stomach and bowels are kept in a state of continual catarrh; and the attacks of vomiting and purging may very possibly be nothing more than acute attacks of gastro-intestinal catarrh induced by some exceptional exposure to cold or damp.

The commencement of the second dentition is a time at which this derangement is especially likely to be set up. Children are often found as the early teeth begin to be displaced by the second crop to grow pale, and thin, and languid; indeed, so frequently is this found to occur, that the beginning of the second dentition is looked upon as one of the critical periods of early life. There is no doubt that, owing to the intimate sympathy existing between all parts of the alimentary canal, there is at the time of dentition a great tendency to an increased activity of secreting functions, and an increased susceptibility to disturbing influences.

Diagnosis.—In a well-marked case the symptoms of this derangement present a remarkable resemblance to those of tuberculosis, with which it is so often confounded; the distinguishing points between the two diseases are therefore of much importance.

The most characteristic symptoms of mucous disease are: the perceptible wasting; the slimy appearance of the tongue; the large quantities of free mucus in the stools; the great want of regularity in the progression of the symptoms; and the periodical occurrence of bilious attacks. If these conditions are observed to follow an attack of whooping-cough, or to occur at the time of the second dentition, if they are accompanied by dry, rough skin and sallow complexion, and if the temperature of the body is not raised above the natural level, we may conclude that the illness is due to the cause which has been described.

With regard to the heat of the body it must be remembered that a continued elevation of temperature is necessary to demonstrate the existence of tuberculosis. In mucous disease the temperature may be elevated temporarily by passing sources of irritation, and thus may be found to be high on two or three successive days. In these cases, therefore, some caution should be exercised in making a diagnosis, and further observations will be necessary before we can feel ourselves justified in giving a positive opinion upon the nature of the disease.

Cases, however, of this derangement occur in which the temperature rises and remains elevated, perhaps permanently, although the symptoms in other respects correspond to those of mucous disease. Pneumonia is very apt to attack such patients, and it is not at all uncommon for the deposit, remaining entirely or partially unabsorbed, to undergo cheesy transformation and form the so-called pneumonic phthisis,—one of the many varieties of pulmonary consumption. In such cases it is often a very nice point to decide upon the presence or absence of grey tubercle; but by careful consideration of the history of the acute attack, and by minute observation of the seat and progress of the physical signs, a diagnosis can be generally arrived at (see diagnosis of pulmonary phthisis). If the formation of grey tubercle occur at all in such cases, the coincidence must be looked upon as accidental, for mucous disease is quite distinct from the tuberculous diathesis and independent of it.

Treatment.—For the cure of this derangement the strictest attention to diet is indispensable. The morbid condition to be overcome is the excessive secretion of mucus from the whole lining of the alimentary canal; and one of the most effectual measures for restraining this morbid glandular activity is the prohibition of all articles of diet capable of undergoing fermentation, and so of increasing the irritation of the mucous membrane. All farinaceous articles of diet, except bread, must be, therefore, at once forbidden, and even the bread should be considerably restricted in quantity, and should be eaten stale, or in the form of dry toast. Potatoes, peas, beans, turnips, carrots, parsnips, beet-root, fruit, cakes, and pastry must all be excluded from the diet, and the child should be nourished as nearly as possible upon meat, eggs, and milk. Too much food is not to be given at once, for all overloading of the stomach is to be avoided. It is better to distribute the amount allowed over four meals rather than three, and these should be fixed at regular intervals throughout the day.

A good scale of diet for a child over two years old is the following, given in four separate meals in the course of the day:—

First meal.—Fresh milk, diluted with a third part of lime-water, or alkalinized with from ten to twenty drops of the saccharated solution of lime. A small slice of dry toast or of dry stale bread with butter.

Second meal.—A small mutton chop, or a slice of roast mutton or beef. Dry toast or stale bread. If the child be four or five years old he may take with this meal a little vegetable, as well-boiled cabbage, spinach, or broccoli.

Third meal.—A cup of beef-tea or mutton-broth, free from grease; or the yoke of a lightly-boiled egg; dry toast.

Fourth meal.—A cup of cocoa made with milk; dry toast or stale bread with butter.

It is not always easy to persuade children to submit readily to the deprivation of starchy food, for which, and especially for potatoes, there is often in these cases a great craving. So long, however, as the slimy appearance of the tongue, before described, continues to be observed, the above diet should if possible be adhered to. When potatoes are once more allowed they must be well boiled, and should be afterwards carefully mashed with a spoon.

Gravy may be poured over them before they are eaten. A good substitute for potatoes in these cases is the flower of cauliflower very well boiled. Other allowable vegetables are turnip-greens, asparagus, French beans, vegetable marrow, Spanish onions, lettuce and celery (stewed). The diet may be varied by substituting for the mutton-chop a little roast chicken or game. Well-boiled turbot, cod, sole, or mackerel may also be permitted.*

Alcohol may be given with advantage in many of these cases, and where the strength has been much reduced is of considerable service in improving the appetite and increasing the digestive power. Half a glass of dry sherry diluted with water may be taken at dinner, or double the quantity of light claret and water.

When the derangement has existed for some time, and the general nutrition of the body is much lowered, the appetite may fail. In these cases it is often difficult to persuade the child to take nourishment, especially as his chief craving is for bread and butter, potatoes, and all the articles of diet which are particularly injurious. Meat is in these cases often extremely distasteful to him. A lark or a snipe will, however, by appealing to his fancy, sometimes overcome this dislike, and every means should be tried, by varying his diet within the prescribed limits, to induce him to take a sufficient quantity of food.

At the same time every effort should be made to restore the proper action of the skin. At night the child must be bathed with hot water, and after being carefully dried must be anointed over the whole body with warm olive oil: this process to be repeated regularly every evening at bedtime. In cases where the skin is especially dry and rough, it is well on the first evening to remove the hardened epithelium by a thorough washing with soap, using hot water softened by the addition of a handful of carbonate of soda. In the morning the child should have a warm sponge bath. Under such treatment the skin will quickly recover its natural appearance and become soft and supple.

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* For tabulated diets, see Chapter XI., Diets 19, 20, 21.

The child should be warmly clothed, and should take plenty of exercise in the open air: if the weather be mild, almost the whole day should be passed out of doors. He should wear a shirt and drawers of flannel, or a pure wool "combination" garment; and his belly should have the additional protection of a broad flannel binder. Moreover, very special care should be taken to keep the feet warm.

The above measures—even if no medicines have been given at all—will after a very short time produce a marked improvement in the appearance of the child. The stoppage of starchy food, and especially of potatoes, will by itself remove a great many of the more distressing symptoms; the restlessness at night, in particular, usually ceases at once. There are, however, certain medicines which should not be neglected; but those most calculated to assist the object we have in view, are not those which under the name of tonics are usually resorted to when from any cause healthy nutrition of the body appears to be in abeyance. The best tonic is nourishing food. But that the food taken may be nourishing, it must first of all be digested; and those medicines will be the real tonics which enable the alimentary canal properly to perform its functions. Our object, as has been before remarked, is to check as rapidly as possible the excessive secretion of mucus which prevents the food from being sufficiently mixed with the digestive fluids, and impedes the action of the absorbent vessels. Various medicines will accomplish this result. Thus, alkalies not only appear to have an influence in arresting the secretion of mucus, but also, by at once neutralizing any acid formed by the fermentation of food, produce a rapid change for the better in the general symptoms. The best form in which they can be given is the bicarbonate of soda with a bitter, as the infusion of calumba. To each dose may be added half a grain of iodide of potassium, to increase the salivary secretion, and twenty drops of the tincture of myrrh, which is found to have a powerful bracing effect upon the mucous membrane. The mineral acids—at any rate in severe cases of this derangement—often appear to be rather injurious than beneficial; certainly the improvement under their use is not nearly so rapid as in cases where alkalies are used. The influence of the latter in improving the appetite, when that is failing, is most marked, especially if a drop or two of dilute hydrocyanic acid be added to each dose of the mixture, and will often succeed when dilute nitric acid has been given without any effect.

Aloes is also a most valuable medicine. Under its use the amount of mucus appearing in the stools diminishes rapidly; the digestion improves; and all the symptoms showing irritability of the nervous system—such as restlessness at night, bad dreams, startings, grinding of the teeth, moroseness, and ill-temper—quickly subside. The effect upon the rest at night is usually most marked, the child beginning to sleep soundly after only a few doses of the drug. The most convenient form in which it can be given is the compound decoction, which, if well made, is seldom objected to by children; the liquorice and the compound tincture of cardamoms it contains very effectually disguising the nauseous bitter of the aloes. It may be given in doses of one or two drachms twice or three times in the day. In such quantities, especially if taken between the meals, it does not act as a purgative, but merely produces a tonic effect upon the bowels, checking immoderate secretion.

It must be stated, however, that the aloes appears to be more beneficial in winter than in summer. In warm weather it is apt to be too irritating, exciting looseness of the bowels. When such is the case, the drug should be at once stopped, and a change be made to alkalies, or to some of the other preparations recommended.

Decoction of oak bark in half-ounce doses is also often of service.

In cases where the emaciation and debility are very decided, iron may be combined with the special treatment; for although tonics, when given alone, are found to be of slight advantage so long as the functional derangement of the alimentary canal continues marked, yet, in combination with remedies directed especially to rectify that derangement, iron is often of much use. Thus, the citrate of iron and ammonia may be given with sal volatile in the alkaline mixture, or a teaspoonful of iron wine may be added to each dose of the decoction of aloes, or the aloes may be combined with the tartrate of iron and potash, as in the following mixture :—

℞. Ferri tartarati, gr. v ;
Decocti aloes co., ʒij ;
Aq. ad ℥ss. M. Ft. haustus.
To be taken three times a day.

During the course of the above treatment, it will be necessary to prevent the accumulation of mucus in the bowels by the occasional administration of an aperient. A teaspoonful of the compound liquorice powder may be given fasting, twice a week; or forty to sixty drops of the liquid extract of rhammus frangula * may be given in a wineglassful of water.

If, as is so often the case, worms be present, special measures for their expulsion must be resorted to, as will be described in the following chapter.

The following case well illustrates the rapid improve-

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* This drug, which is a variety of the buckthorn, but less drastic in operation than the ordinary rhammus cathartica, is a very safe and agreeable aperient for children.

ment which takes place when the above treatment is adopted.

John R., aged 11 years. Had an attack of scarlatina three years ago, and has since been persistently wasting.

He was first seen on February 25. "A very pale, thin boy, subject to occasional attacks of faintness, without, however, actually losing consciousness. Face has a careworn look, and he is troubled with an occasional short hacking cough. Appetite very bad. Tongue thickly furred and slimy, with depressed large pink papillæ covering its dorsum and sides. Bowels confined, acting about every other day: stools hard and dark, the fæcal matter often covered with mucus. Occasionally threadworms are seen in the motions. Sleeps very badly, and often seems to be "light-headed" at night. Is not subject to attacks of purging. Never perspires: the skin all over the body is exceedingly rough and harsh: chest and belly covered with coarse, dry epithelium, which can be rubbed off as a fine dust. Examination of the lungs and heart shows no sign of disease."

The mother was directed to wash the boy at bedtime with soap and hot water containing soda; and afterwards to anoint his whole body well with warm olive oil. She was to repeat the oiling every night after bathing him with hot water. She was further ordered to give him a tepid sponge bath every morning.

Diet to consist of meat, eggs, and milk, with a little dry stale bread.

The following medicines were prescribed:—

℞. Pulv. rhæi,
Pulv. jalapæ, āā gr. vij;
Pulv. scammon., gr. x. Ft. pulv. iv.
One powder to be taken every other morning.

℞. Decocti aloes co.,
Vini ferri, āā ʒij. M. Ft. haustus.
To be taken three times a day.

The improvement in this case was most rapid. In a week's time the skin had become naturally soft and supple, and the boy was beginning to gain flesh. His appetite improved, and he slept better at night. The increase in weight was very remarkable. He weighed on March 3rd, fifty-seven pounds; on March 6th, fifty-eight pounds; and on March 15th, sixty-two pounds. By this date (March 15th) the boy's appearance was quite changed: he had completely lost the careworn look which had been so noticeable on his face at the first visit, and the cheeks were much fatter, although still pale. The body generally was much fatter, and presented a marked contrast to his former emaciation. The cough was gone; he slept soundly at night, perspiring a little, especially about the nose and mouth. The bowels remained costive, and the motions hard, but they contained very much less mucus, although there were still a few thread-worms in the stools after each powder, and occasional pains in the belly were still complained of. The tongue was much pinker, and had lost in a great measure its slimy appearance.

We sometimes find that after the treatment has been continued for a certain time, the improvement becomes less rapid or even ceases. When this occurs it is advisable to change from alkaline to acid medicines. The necessity for the change seldom, however, occurs before the tongue has in a great measure lost its slimy appearance, and mucus has almost ceased to be seen in the stools.

In such cases it is best to begin with a nitro-muriatic mixture with a bitter. Thus:—

℞. Acidi nitro-muriatici dil., ♏iij;
Tinct. aurantii, ♏x;
Aq. chloroformi, ad ℥ss;
M. Ft. haustus.
To be taken before food, three times a day.

Other acid preparations may also be used, as the liquor ferri pernitratis in bitter infusion; quinine, with dilute nitric acid, &c.

Cod's liver oil is of comparatively little value as long as the mucous flux persists. When, however, free secretion from the mucous membrane has been controlled, oil will aid in repairing the effects of mal-nutrition; but it should be given only in moderate doses (20 to 30 drops).

Change of air is of much service. Removal to a bracing seaside air, such as that of Brighton or Westgate, will often after a very short stay produce a very great improvement in the symptoms and general appearance of the child.

CHAPTER VII.

WORMS.

WORMS.—Varieties—Description—Oxyuris vermicularis—Ascaris lumbricoides—Tricocephalus dispar—Tænia solium—Tænia medio-canellata—Bothriocephalus latus—Development and mode of obtaining admission into human body.

Symptoms.—Due principally to the accompanying derangement of stomach and bowels—Emaciation—Pain—Disturbance of nervous system—Convulsions—Symptoms when digestive derangement is trifling—Special symptoms with each variety of worm.

Diagnosis.—From tuberculosis—From tubercular meningitis.

Treatment.—Two objects—To expel worms—Different remedies required for each variety—Purgatives—Enemata—Santonine—Turpentine—Oil of male fern—To restore the healthy condition of alimentary canal—Treatment of prolapsus ani.

THE varieties of parasitic worms found in children are :—

NEMATODES—

Oxyuris vermicularis, the small thread-worm.
Ascaris lumbricoides, the long round worm.
Tricocephalus dispar, the long thread-worm.

CESTODES—

Tænia solium, the common tape-worm.
Tænia medio-canellata, the hookless tape-worm.
Bothriocephalus latus, the broad tape-worm.

Of these the two first-mentioned varieties are by far the most common species found in the child. The tænia is rare in children under the age of six years, and the bothriocephalus is seldom seen in England, although common enough in Switzerland and Russia. When found in this country, it is usually in persons who have resided abroad.

*Description.**—The *Oxyuris*, or *Ascaris vermicularis*, belongs to the order *Nematoda*. The male measures one-sixth of an inch in length, and its caudal extremity is obtusely pointed. The female is from a third to half an inch in length, and has a long, gradually tapering capillary tail, which terminates in a three-pointed end. This has been supposed to act as a kind of holdfast.

Both sexes have a more or less fusiform body, the anterior end being narrowed to form a somewhat abruptly truncated head. The mouth is tripapillated, leading into a triangular œsophagus. The integument is transversely striated, and is of a silvery white colour. The penis is single, simple, and very minute. The eggs are long, unsymmetrical, and measure about $\frac{1}{1400}$ in. from pole to pole, and $\frac{1}{900}$ in. the greatest transverse diameter.

The seat of the worms is the cæcum, but they readily migrate thence into the sigmoid flexure and rectum. They are not found in infants at the breast, unless other food is being given at the same time with the breast-milk, but are exceedingly common in older children.

The *Ascaris lumbricoides*, also a nematode, is much larger than the preceding. The male measures from four to six inches long, the female from ten to fourteen. The body, smooth, fusiform, and elastic, is marked by fine transverse rings, and tapers gradually towards either extremity. The mouth is tripapillated; the tail is obtusely pointed. The male is distinguished from the female by a double penis, and by the arcuate form of its tail. The female is broader than the male, being about a quarter of an inch in diameter.

These worms inhabit principally the small intestine, but often pass into the stomach and other parts of the alimentary canal. They are most common between the ages of three and ten years. Their number varies from two or three to twenty, thirty, or even more; they are seldom solitary.

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* The description of these worms is borrowed from Dr. Cobbold's work on Entozoa, London, 1864.

The *Tricocephalus dispar* is not very common in England, but is sometimes found after convalescence from typhoid fever. The male measures an inch and a half in length, the female two inches. This worm is specially characterized by an extremely long filiform neck, which occupies about two-thirds of the length of the body. The surface of the skin is smooth to the naked eye, but when magnified is found to have on one side a longitudinal band of minute wart-like papillæ, at the borders of which the ordinary circular striæ of the integument terminate. The tail of the male worm is curved, and has at the extremity a short tubular penis-sheath armed with minute retroverted spines. The tail of the female is straight and blunt-pointed.

The worm inhabits chiefly the cæcum and the colon.

The *Tænia solium* belongs to the order *Cestoda*. Its length is very great, often ten, twenty, thirty feet, or even more. In breadth it is about a third of an inch at its widest part. The head, globular and about the size of the head of a small pin, is produced in front so as to form a short cylindrical proboscis, which is armed with a double crown of hooks numbering from twenty-two to twenty-eight in each circular row. The head is also furnished with four sucking discs, situated at the four angles. The neck is very narrow, and is about half an inch in length; it is continued into the anterior part of the body, which is sexually immature, and presents only traces of segmentation in the form of fine transverse lines. These lines become gradually more and more widely separated, having short interspaces; and eventually the imperfect segments become more distinctly marked, and true joints are seen. The earliest formed immature joints are very narrow; and it is not until about the four hundred and fiftieth segment from the head that they become sexually mature. The mature segment is called "pro-glottis." The total number of joints in a worm ten feet long is about eight hundred. A mature proglottis is about twice as long as it is broad. It is comparatively thin and transparent, and is furnished with a branched uterus, which consists of a central, longitudinal stem, giving off from seven to ten branches on either side. Each joint has a common reproductive papilla placed at the border on one side below the middle line, but not uniformly to the right or left in series. The male orifice is above the vaginal outlet. The penis is sickle-shaped. The Tænia solium is usually solitary. It is seldom seen in children under three years old. Its seat is the small intestine.

The *Tænia medio-canellata* resembles the preceding in every respect except in the head; the cylindrical proboscis and the double crown of hooks being absent.

The *Bothriocephalus latus* is the largest of the cestode worms which infest the human body. In length, it is often five-and-twenty feet, and it is about an inch in breadth.

The head measures one-twenty-fifth of an inch in breadth, is blunt at the top, elongated, and slightly flattened from behind forwards. It is furnished with two laterally disposed slit-like grooves, but is destitute of hooks. The anterior segments, which are sexually immature, are extremely narrow, and enlarge very gradually from above downwards. After reaching their greatest width in the centre of the body, they begin gradually to decrease in width, but increase in depth; so that while in the central segments the width is much greater than the depth, being as one inch to one-eighth of an inch, in the joints near the caudal extremity, the breadth and the depth are about equal, being frequently a quarter of an inch in either measurement. The body is flattened, but not so uniformly as is found in the Tænia solium, as it is rather thicker in the centre than at the sides. The total number of joints has been estimated at about four thousand, the first sexually mature one being the six-hundredth from the head.

The reproductive orifices are in the middle line towards the upper part of the segment on the ventral aspect. The vaginal aperture is immediately below the male outlet, and both openings are surrounded by papilliform eminences. The uterus consists of a single tube, often folded regularly upon itself so as to form an opaque centrally-disposed rosette-like mass.

The embryo is ciliated, and moves freely about in water.

All these varieties of worm obtain admission into the human body by the mouth. The ova of the thread-worm are introduced adhering to fruit, cresses, and other articles of food. Sometimes, also, they are conveyed to the mouth directly by the child. The ova of the oxyuris are very numerous, and when exposed to the action of the gastric juice, the tadpole-shaped embryos escape from the eggs into the stomach. The creatures develop rapidly as they pass down the alimentary canal, and have reached maturity by the time the cæcum is arrived at. The eggs deposited at this part of the digestive tract are not hatched, but escape in large numbers by the bowels. Dr. Cobbold states that children often carry the ova in large numbers under their nails; for the excessive itching of the fundament, to which the presence of the parasites gives rise, necessitates much rubbing and scratching for its relief. By this means a continual supply of ova can be introduced into the mouth.

From observations made by Grassi, it seems probable that the common house fly may sometimes serve as the medium by which the eggs of parasitic worms are conveyed to the human subject. This observer has shown by direct experiment that the insects are able to take in the ova of certain worms by the mouth and void them unchanged in the fæces. In this way eggs may be deposited directly upon the food shortly before the child swallows it.

In the case of the ascaris lumbricoides the drinking of impure, unfiltered water is the ordinary method of admission. M. Davaine* doubted whether the embryos could become developed in the human intestine; but Heller states that the eggs may be hatched, and the embryos escape, and develop into the mature worm, while still in the alimentary canal of the person infested with them. Out of the body the embryos develop very slowly, for Davaine kept some alive for a period of five years without the embryos making any attempt to escape from their shells. The creatures have, however, a singular tenacity of life, for they cannot be destroyed by frost, and even, it is said, survive complete desiccation.

In the case of the Tænia, each pro-glottis, or mature segment, is complete in itself, being furnished with male and female reproductive organs. When this has become impregnated, by contact with another pro-glottis, eggs are formed in it. In each egg is developed an embryo which remains unhatched as long as the ovum continues in the body of the parent. The segment, after its expulsion from the bowel, moves about for a time until it bursts from the growth of the embryos in its interior, and the ova escape. Each embryo is provided with a boring apparatus, having three pairs of hooks at its anterior end. Unlike the other worms which have been described, the embryo of the tape-worm cannot pass through all the stages of its development in the body of the same individual. The creature does not develop directly into the perfect tænia, but passes through a stage of transition. This stage requires to be completed in the body of an intermediary. Thus, when eaten by some animal, such as a pig or a rabbit, the embryo breaks its shell, and, boring through the intestinal wall of the animal, lodges itself in the fatty parts of the flesh. It then drops its hooks and becomes the well-known Cysticercus cellulosæ. When the flesh of an animal containing the Cysticercus is eaten, the parasite attaches itself to the wall of the bowel, and growing from its lower or caudal extremity, developes into the community of individually distinct creatures which is known as the perfect tape-worm.

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* C. Davaine, Recherches sur le Développement et la Propagation du Tricocéphale de l'Homme et de l'Ascaride Lombricoïde. Comptes Rendus à l'Académie des Sciences, t. xlvi., 21 Juin, 1858.

It appears, therefore, that flesh infested with the cysticercus, is the ordinary source from which the tæniæ are derived. Pigs are very liable to be so infested, and in rabbits it is exceedingly common, very few being found altogether free from tape-worm; in these animals it is the Tænia solium.

Oxen are sometimes infested with the embryo of the Tænia medio-canellata; and in children treated for chronic diarrhœa upon the raw-meat plan, and who become in consequence affected with tape-worm, as is said sometimes to happen, it is to this worm that their symptoms are due. Indeed, it may be said that in the human subject, of all the varieties of tape-worm the Tænia medio-canellata is the one most frequently met with.

The transitional stage of the Bothriocephalus latus, according to Dr. Braun of Dorpat, is completed in the body of the pike.

Symptoms.—The presence of worms in children is usually accompanied by an unhealthy condition of the alimentary canal, which precedes their appearance, and continues after the worms have been expelled. Perhaps few of the symptoms—and they are very numerous—which are found while the worms exist in the body, can be directly attributed to the presence of these parasites, as they may all of them, or nearly all, be found also in cases where repeated purgatives have convinced us that worms are absent. They are, therefore, probably due in great part to the abdominal derangement which favours the development of the entozoa.

This derangement has been already described in the previous chapter.

As a result of it, nutrition becomes impaired, and the child wastes. The face becomes puffy and pale; the lower eyelids dark, and sometimes leaden-coloured; the pupils often dilated. There is itching of the nose and anus; epistaxis may occur; and the sense of smell is occasionally depraved or lost. The upper lip often swells; the breath is fœtid, especially in the mornings; and salivation is sometimes noticed, the saliva running from the mouth on to the pillow during sleep.

At night the child is very restless: during sleep he starts, twitches, and grinds his teeth; and he often wakes in great panic, crying and talking wildly. There is often a frequent dry troublesome cough, a symptom considered by Stoll very characteristic of the presence of worms; and sighing, sobbing, and hiccough are not uncommon.

The belly is swollen and hard. Pain in the abdomen is often complained of, the pain being usually confined to one or two points, especially about the umbilicus. In character it is tearing or cutting, although sometimes it is merely an uneasy creeping sensation, or a feeling of cold in the bowels. The pain is sometimes felt in the chest.

The appetite is capricious. At one time there is constant craving, the hunger seeming to be almost insatiable: at others the child refuses all food, and great anxiety is excited by the difficulty found in persuading him to take nourishment. Sudden attacks of nausea may come on with sour-smelling eructations, and vomiting may occur with expulsion of worms from the mouth. Lumbrici are not unfrequently ejected in this way. The bowels are much confined; the constipation yielding readily to purgatives, but returning when the action of the medicine has subsided. Sometimes there is tenesmus, with constant ineffectual desire to go to stool; and attacks of diarrhœa are very liable to come on, with very great straining, the motions passed being black, slimy, and extremely offensive. Micturition is often painful and difficult, and the urine whitish or milky. Discharges of mucus may take place from the rectum, and in female children often from the vagina.

The pulse is often small, quick, or slow and irregular. The temper is irritable, or the child is sullen and morose. Attacks of syncope are sometimes seen, and there may be passing delirium, or even profound stupor. Other disordered conditions are enumerated as resulting from the presence of worms, as sudden blindness; loss of voice; squinting, or fixed state of the eyes; vertigo; general convulsions. According to Dr. Underwood, an attack of convulsions, accompanied by small pulse and hiccough, is an almost certain sign of worms.

As the majority of these symptoms are due, not to the worms, but to the condition of the alimentary canal usually accompanying the parasites, the symptoms are severe in proportion to the abundance of the mucous flux. If this be copious, digestion is very greatly interfered with, nutrition is seriously impaired, and all the symptoms arising from indigestion and irritability of the nervous system are strongly marked. Worms may, however, be found in children in whom the alimentary canal is almost healthy. The general symptoms are in such cases exceedingly trifling, and the appearance of the tongue differs widely from that described in mucous disease.* It is then neither flabby nor slimy; but is small and pointed, reddish at the tip, and is covered on the dorsum with a thin curdy fur. The papillæ are still large, but are less conspicuous, and their outline, instead of being evenly and clearly marked, is very irregular.

Certain *special symptoms* are associated with different varieties of worm.

The *Oxyuris vermicularis* occasions violent itching at the anus. This is most marked towards the evening; and the irritation not only prevents the child from going to sleep, but may be so intense as to produce extreme distress. The irritation, propagated to neighbouring parts, may excite a mucous discharge from the vagina, and is said to be a cause of masturbation.

A common symptom where these small thread-worms are present is tenesmus, the desire to go to stool being frequent but ineffectual; and the straining may cause prolapsus ani, which often continues after the worms have been expelled. Besides, the irritation propagated over the whole intestinal tract is apt to give rise to diarrhœa. Migration of the oxyuris occasionally takes place, and cases are on record in which these worms were found in the vagina, uterus, urethra, œsophagus, and stomach.

When the presence of the oxyures is suspected, they will be often found on examination moving about in the radiating folds around the anus.

The *Ascaris lumbricoides* gives rise to pain more or less severe, situated at one or two points of the belly in the neighbourhood of the umbilicus. Sudden nausea is apt to occur from the passage of the worm into the stomach, and it is sometimes expelled by the mouth. The lumbricus is more apt than the preceding variety to give rise to nervous symptoms; and vertigo, convulsions, chorea, &c., sometimes seem to result from its presence, although it is very difficult to estimate the exact share which worms take in the production of these disorders. How much is due to the irritation of the parasites, and how much to the general irritability of the nervous system set up by the functional derangement of the alimentary canal, is a question which it is not easy to decide.

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* See page 216.

The irritation of the lumbrici may give rise to a chronic diarrhœa, lasting often for months. The motions are scanty, offensive, of the colour and consistence of thin mud, and are evacuated with much straining, and sometimes prolapsus ani. They are more frequent in the night than during the day. A child of three years old lately came under the writer's notice, who had suffered for nearly eight months from persistent looseness of the bowels. The diarrhœa ceased after the expulsion of twelve lumbrici.

The lumbricus is very migratory in its habits. The wanderings of these worms usually occur at night. At this time they become very active, and may pass out of the alimentary canal into passages communicating with it, or even into adjacent organs which have no direct communication with the digestive tube. Thus, they have been noticed in the common bile duct, and in the gall bladder, in two cases recorded by M. Guersant, where the children died suddenly in violent convulsions. They have also been seen in the nasal passages, the larynx, trachea, the larger bronchi, in the vagina, and even in the urethra and bladder. Again, the worms may be found in abscesses communicating with the intestine, having escaped from the bowel by entering a pre-existing fistulous opening. The abscesses are generally in some part of the abdominal wall, usually the umbilical or inguinal regions, or in the substance of the liver.

The passage of a lumbricus into the windpipe is a rare but very dangerous accident. This mishap has occurred more frequently than might be anticipated, for nine cases have been collected by Dr. Fürst of Vienna, and no less than sixteen have been recorded by Davaine. If the worm remain in the glottis, its presence gives rise to the most intense dyspnœa and complete loss of voice; and the patient very shortly dies asphyxiated. If the parasite pass into the trachea or bronchus, there is dyspnœa occurring in violent paroxysms, and pain referred to the front of the chest. Aphonia may persist or the voice may partially return. The irritation induced by the presence of the worm soon sets up bronchitis, and the child, if not carried off early by suffocation, usually succumbs more or less quickly to this complication. In such cases as these it is by no means easy to discover the cause of the sudden interference with respiration; for the only clue to the presence of a lumbricus would be the knowledge that the patient had previously suffered from these worms. If the access take place first at night-time, the symptoms would be probably referred to an attack of stridulous laryngitis. If in the day, the fact of the patient's freedom from catarrh, or any tendency to hoarseness, would perhaps suggest the presence of a foreign body in the windpipe, but the nature of the intruding substance could hardly be divined in the absence of special information.

The *tæniæ* produce sensations of weight, and sometimes of gnawing in the belly, rising occasionally to severe attacks of colic, accompanied by considerable swelling of the abdomen, especially about the umbilicus. The appetite is usually large, and there is progressive emaciation, which is more marked than in the other varieties. Vomiting and diarrhœa are rare. Cephalalgia is not common, but when it occurs it is often remarkably persistent. There is usually great lassitude, with sometimes cramps in the extremities. Fragments of the worm are passed in the stools.

With the presence of the *Tricocephalus dispar* no special symptoms have been associated.

Diagnosis.—The only satisfactory proof of worms is their presence in the stools: any symptom or any combination of symptoms may be produced by other diseases, so that a purgative becomes the crucial test. It must be remembered, however, that although worms may be present, it does not necessarily follow that they have been the cause of the symptoms for which advice is required. Tuberculosis, rickets, or other constitutional diseases may exist at the same time, the presence of the entozoa being an accidental and often a trifling complication. In such cases the symptoms will continue after the worms have been expelled.

The fact appears to be, that the large majority of the symptoms are due to the derangement of the stomach and bowels, which is almost always associated with the parasites, and of which they appear to be rather a result than a cause, although no doubt the irritation they excite tends to encourage the derangement. When the mucous membrane of the alimentary canal is in a healthy state there is no *nidus* for worms, and it appears probable that a favourable medium is essential to their development in any quantity. The required nidus is found in the alkaline mucus which is so abundantly secreted; and in this they develop very rapidly. It is more important to detect the presence of some worms than of others. The tæniæ produce very great emaciation; and the lumbrici, if present in large numbers, may cause serious interference with nutrition; but the oxyures are of comparatively little moment, and unless the irritation be so great as to prevent sleep, are seldom attended with any great inconvenience.

The symptoms attending the presence of worms may be so severe as to give rise to suspicion of the formation of tubercle. Thus, if a child has irregular attacks of fever;

begins to lose flesh; sleeps badly, grinding his teeth at night, becomes pale and heavy-eyed; loses his cheerfulness, and gets languid and dull; has a capricious appetite, being sometimes ravenous, and at other times showing a disgust for food, with bowels alternately relaxed and constipated—in such a case the existence of tuberculosis may be suspected. If, however, the symptoms are due to worms, an active purgative will give evidence of their presence, and by clearing away a quantity of the tenacious mucus will cause an immediate improvement in the symptoms: afterwards suitable remedies and careful diet will restore the alimentary canal to a healthy condition (see diagnosis of mucous disease, page 222).

In other cases, where the nervous symptoms are well marked, and are accompanied by a dilatation of the pupils, vomiting of watery fluid, constipation, and a slow, irregular pulse, tubercular meningitis may be suspected. Here, however, the fact that signs of digestive derangement have preceded the nervous symptoms, the absence of headache and of fever, the readiness with which the constipation yields to a mild purgative, and the relief to the symptoms which follows the action of the aperient, will clear up the diagnosis. Besides, in these cases a history can often be obtained of the previous occurrence of similar attacks.

In cases where abdominal pains are complained of by children a careful examination of the chest should always be made, as in them the pain of *pleurisy* is very commonly referred to the belly, and not to the thorax.

*Treatment.**—In the treatment of worms, it is not sufficient to expel the parasites from the body, for so long as the unhealthy condition of the alimentary canal continues to provide a nidus for the entozoa, they may be reproduced again and again as often as they are driven out. There are therefore two indications to fulfil in the treatment of this complaint, viz.:—

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* All the prescriptions given in this chapter are adapted to a child of four years old.

To expel the worms.

To destroy the nidus by restoring the alimentary canal to a healthy condition.

To expel the worms different measures must be employed, according to the variety of worm to be attacked.

The *oxyures*, which inhabit the cæcum and lower bowel, are within the reach of injections, and are best treated by this means. Various enemata may be used: thus, four or five ounces of strong infusion of quassia, to which twenty drops of tinct. ferri sesquichloridi have been added; the same quantity of lime-water; or a solution of one drachm of common salt, dissolved in five ounces of distilled water, may be administered. Whatever form of enema be used, it should be given at bedtime, should be used tepid, and should be preceded by a large injection (30 ozs.) of warm soap and water, so as to empty the colon as thoroughly as possible.

The diarrhœa which is so common when the oxyures are present is readily arrested by a purgative, as castor oil, or the following powder:—

R. Pulv. Rhæi, gr. viij;
Sodæ bicarb., gr. vj;
Hyd. cum critâ, gr. ij. Ft. Pulv. Primo mane sumendus.

This powder should be given every second or third morning, and every evening the injection should be repeated, until no trace of the worms is found in the stools, or in the returning enema.

Great irritation of the rectum may be allayed by the injection of an ounce of thin warm starch, containing, if necessary, a few drops of laudanum, before the child is put to bed; or a towel wetted with cold water may be applied to the fundament while in bed.

For the *lumbricus* and the *tricocephalus dispar* the best remedy is santonine, which may be given either alone or combined with purgatives. A good combination is the following:—

℞. Santonini, gr. viij;
Pulv. zingib., gr. x;
Pulv. jalapæ, ℈ss;
Sulphuris loti, ʒjss;
Conf. sennæ, ℥j. M. Ft. confectio.

Of this confection a teaspoonful should be given every morning. Or santonine may be usefully combined with calomel, as in the following powder:—

℞. Santonini, gr. j;
Hydrargyri subchlorid., gr. ½. Ft. Pulv. Mitte, iij.
Sig. One powder to be given every night. To be followed each morning by half an ounce of castor oil.

When given alone, santonine is conveniently administered sprinkled on a slice of bread and honey, in doses of one or two grains, twice or thrice in the day. In such cases an occasional aperient will be required to carry off the dead worms.

Santonine usually increases the flow of urine, and may give a reddish tint to that secretion. Another effect sometimes found to be produced by the drug is a peculiar perversion of the sight, in which all objects are seen of a green colour. This symptom is of no importance, and readily passes away when the drug is omitted, but it is well to warn parents of its liability to occur. It is, however, necessary to know that some children are unusually susceptible to the action of santonine. A dose as small as four grains has been known, in a child of four years old, to produce profound coma, and stertorous breathing, with depression which has lasted more or less for twenty-four hours. The drug is not very rapidly taken up by the absorbent vessels. Therefore in all cases where poisonous symptoms are noted a stiff aperient should be administered without delay to remove any unabsorbed portion of the drug from the bowels. At the same time the child should be plied with diuretics to hasten the elimination by the kidneys of the poison already absorbed into the circulation.

Many other drugs have been recommended for the expulsion of these worms; thus mercury, antimony, granulated tin, nitrate of silver, and arsenic; kamala, kousso, assafœtida, tannin, valerian, and corsican moss; all these drugs alone, or variously combined, have been used and found successful in these cases. Cowhage (the hairs of the Mucuna pruriens) in doses of thirty to sixty grains given twice a day in syrup or treacle is a favourite remedy with some. The sulphites, especially the bisulphite of soda (ten grains three times a day with tinct. aurantii) are stated by Dr. W. Roe to have a powerful anthelmintic action, possibly, as he suggests, from the sulphurous acid set free by contact with acid secretions. The medicine has no cathartic action, and therefore an aperient is required in most cases to remove the worms killed by the remedy. In all cases, if the drug employed be not in itself purgative, it is well to combine it with some aperient, or at any rate to act gently upon the bowels, from time to time, so long as the remedy is in use. Violent purgatives are not needed, the repeated action of mild aperients being equally efficient in causing expulsion of the worms, without exciting so much irritation of the digestive canal.

In cases where a sudden attack of dyspnœa with aphonia occurs in a child known to be suffering from a lumbricus, the absence of symptoms pointing to another cause for the patient's distress might lead us to suspect the intrusion of a worm into the windpipe. If we feel satisfied as to the correctness of the diagnosis, tracheotomy should be performed without delay. The worm can then be extracted with the forceps.

So long as we have to deal with worms such as the preceding, expulsion is easily effected, but a case of *tænia* presents more difficulty. Tape-worms are often exceedingly tenacious in their hold. This is especially the case with children, whose softer mucous membrane probably adapts itself more readily to the action of the suckers. Consequently, although yards of segments may be removed by means of an ordinary aperient, the small head almost invariably remains behind, and can only be dislodged by the use of special precautions.

In all cases of tape-worm, the alimentary canal contains a great excess of mucus, which protects the head of the worm from the action of the anthelmintic as this passes down the bowel. For some time, therefore, before special treatment is had recourse to, the child should be put upon a non-farinaceous diet, as recommended in the previous chapter, so as to diminish the amount of mucus, and as far as possible correct this derangement of the bowels. For the week immediately preceding the administration of the vermifuge, the child should be forbidden even bread, and should take as a substitute Dr. Camplin's bran biscuits or the more palatable French gluten bread. After this preparation, the anthelmintic may be given with some prospect of success. The favourite drug for this purpose, and probably the most effectual one for ordinary cases, is the liquid extract of male fern. The quantity required is considerable, but as its action is solely upon the worm, a large dose may be given to young subjects without hesitation, or any apprehension of doing injury to the child. The remedy is best administered pure, floating upon peppermint or other aromatic water.

The mode of proceeding is as follow, and if the child be strong enough to bear the necessary fasting, this method seldom fails: In the evening a dose of castor oil is given. The following morning, or as soon as the bowels have been well relieved by the aperient, a drachm and a half of fern extract floated on peppermint water is swallowed. After three hours this dose is followed up by a second quantity of castor oil. During the above treatment, a rigid abstinence from all food is essential to success, and, therefore, from before the first dose of the oil until after the worm has been expelled, somewhere about the middle of the following day, no food or drink can be allowed, except occasional sips of water if the patient is thirsty. It is doubtful whether the worm be killed or merely stupefied by the action of the remedy, and, therefore, it is well not to delay too long the administration of the second dose of castor oil. This should be given not later than three hours after the fern extract. Sometimes the nauseous taste of the medicine causes vomiting. In such cases, it is well to quiet the stomach beforehand, by a small dose of laudanum or morphia, given half an hour before the administration of the anthelmintic. The morphia acts merely as a sedative, without interfering in any way with the special action of the medicine.

Another successful vermifuge is kamala, which may be given either alone, in treacle, or made up into a draught in combination with the fern extract. Thus, mix up a drachm of powdered kamala with mucilage, until an emulsion is formed; then add a drachm and a half of fern extract, and triturate in a mortar, gradually adding water to make a three-ounce mixture. Dr. Brunton recommends this to be given after a fast of twenty-four hours in the case of an adult. The writer has used this method in children of seven or eight years old, beginning the fast after a mid-day dinner, and giving the draught the following morning, divided into two doses taken at an interval of three hours; and has found the treatment well borne. Kamala is itself aperient, and this method does not usually require any additional dose to effect the expulsion of the dead worm. If, however, the creature does not appear within four hours of taking the second half of the mixture, a tablespoonful of castor oil may be given.

A favourite remedy on the Continent is a decoction of the fresh bark of pomegranate root. The objections to its use in the case of children are the large quantity of fluid which it is necessary the child should swallow, and the griping pains in the belly which are apt to follow the administration of the drug. M. Collin, who has given pomegranate bark largely, states, that in all cases where the medicine is used, the dose should not be preceded by a purgative, so that the segments may not be separated from the head of the worm. To prepare the decoction:—One pint of water is added to an ounce of the fresh bark, and after standing for twenty-four hours, this quantity is boiled down to one-half. The decoction is then divided into three parts, which are all to be taken in the morning fasting, with an interval of half an hour between each dose. If the worm does not come away in three hours, some castor oil should be given to aid its expulsion. The writer's own experience of pomegranate bark has not been encouraging, but M. Collin speaks in the highest terms of this method of treatment.

Sometimes in children great difficulty is found in relieving the patient of this distressing parasite, and dose after dose of fern extract or other special medicine may be given without dislodging the head from its hold of the mucous membrane. In all such cases, it is well to try the effect of the now neglected, but not the less valuable, vermifuge—oil of turpentine. This may be given either in one large dose, or in frequent smaller quantities. For a large dose, three to four drachms is given in the morning after the usual fast, and is followed in three hours by a spoonful of castor oil, if no aperient effect has been already produced.

The plan of administering the remedy in repeated small doses has been strongly advocated by Dr. Davies.

For children of eight years of age and upwards he recommends half a drachm of oil of turpentine, with an equal quantity of honey, to be administered in a little mucilage and water every six hours. At the same time a powder of calomel, with compound scammony powder, is to be taken every second morning. Dr. Davies states that he has never known tæniæ in children to resist this treatment. A drop of oil of peppermint makes the turpentine mixture more palatable. As the segments grow from the head, we cannot be certain that the entire worm has been expelled unless the head is found. This, therefore, should always be carefully searched for in the excretions.

To fulfil the second indication of destroying the nidus, recourse must be had to the measures recommended in the preceding chapter (see mucous disease). The diet must be first carefully arranged, so as to cut off all articles of food which by their fermentation would give rise to acid, and so favour the abnormal secretion of mucous in the bowels. Alkalies, aloes, &c., should then be prescribed, as has already been directed.

The treatment, however, must be varied according to the condition of the stomach and bowels, and need not be pursued in all its details in every case of worms. If there be little derangement of the alimentary canal, purgatives or injections to remove the worms, followed by a tonic, will be all that is required. It is only in cases where the secretion of mucus is in great excess, and the interference with digestion and assimilation of food is carried to a high degree, that all the measures given above are required.

The *prolapsus ani*, brought about by the great straining excited by the presence of worms, usually disappears when the worms have been expelled. Sometimes, however, it remains as a persistent condition. In such cases the prolapsed bowel should be sponged with warm water after each action of the bowels, and should be carefully returned by careful pressure with the thumbs covered with a soft warm napkin. If the contraction of the sphincter is very violent, and resists the return of the protruded gut, the finger, well oiled, should be introduced into the bowel, and should be passed within the sphincter so as to carry the bowel with it above the contracting ring.

Prolapse may often be prevented by placing the child during defæcation in such a manner that his feet do not touch the ground, and, at the same time, the edge of the anus can be supported by two fingers.

The bowels must be carefully regulated so as to prevent constipation and consequent straining. The child should be warmly clothed, with a flannel bandage round the belly, and should take frequent exercise in the open air.

For medicine, a drop or two of tinct. opii may be added to each dose of the tonic mixture; and twice a day a small astringent injection may be used, as decoction of oak-bark, or of rhatany-root, to give tone to the relaxed mucous membrane, and remove the tendency to prolapse.

These cases seldom give much trouble, and are usually readily cured.

and transparent-looking, allowing the superficial veins to be distinctly seen; the face is oval, and the features generally regular. The complexion is usually clear, but not always; the face is sometimes covered with freckles; and Dr. Gee is of opinion that amongst the poor children of London the existence of freckles is evidence of very singular value of a tubercular tendency. These children are often remarkably good-looking, with large, bright, intelligent eyes, long eyelashes, and soft silken hair. The limbs are straight; the wrists and ankles small. The nervous system is highly developed, and the general organization delicate. The teeth are cut betimes; they walk and talk early; and the fontanelle often closes before the end of the second year.

If we compare this type of body with the peculiar conformation considered to be characteristic of the scrofulous diathesis, we notice remarkable differences. Here the face is more rounded than oval; the complexion is dull and pasty-looking; the skin thick and opaque. The face is not so comely as in the preceding type, although it is by no means necessarily ill-favoured. The features are large; the lips full; the alæ of the nose thick; and the nostrils expanded, so that the nose looks broad. The tongue is often large. The ends of the long bones are full, and their shafts thick. The fingers may be clubbed. The belly is large and prominent. In such children there is great activity of all the epithelial structures. The hair and nails grow rapidly; the skin generally is rough and scaly; and there is often a remarkable development of hair, which is seen as a thick down on the forehead, cheeks, ears, shoulders, and along the spine. There is constant secretion from the nose; the skin about the lips is subject to crack, and to become sore; the eyes often look weak, even when not inflamed; and there is great tendency to ophthalmia, inflammation of tarsi, catarrhs, certain skin diseases, irritation and inflammation of lymphatic glands, to caries of bone, and to a low form of pneumonia.

These two types of body are very distinct, but they are not antagonistic. Tubercular formation may occur as an accompanying phenomenon of either, and either may be marked by that form of pulmonary consumption known by the name of pneumonic phthisis; but of the two, in the tuberculous diathesis there is an especial tendency to the former disease; in the scrofulous diathesis, to the latter.

But, besides the indications of a general diathetic tendency expressed in the physical conformation, we often find in the shape of the chest itself distinct evidence of a consumptive predisposition. From the time of Galen a small chest has been recognized as constituting a special pulmonary weakness, for a small chest implies small lungs. The lungs being small, the thorax is obliged to adapt itself to the size of its contents. The ribs become unusually oblique; the chest is lengthened; the shoulders fall, and as a consequence, the scapulæ project backwards at their lower angles like wings. The latter deformity has given the name of *alar* or *pterygoid* to this variety of chest.

A thorax so elongated does not necessarily deviate in any other particular from a healthy type. The antero-posterior and lateral diameters, although lessened absolutely—for the chest, as has been said, is small—may yet retain their normal relative proportions. In many cases, however, the costal cartilages do not remain firm; they consequently yield under the pressure of the air and become straight, and the antero-posterior diameter of the thorax is diminished. A *flat* chest is thus produced, which may or may not be combined with the alar deformity of the shoulder blades.

These two varieties of shape of the thorax may be considered to indicate a pulmonary weakness—an abnormal sensitiveness to unhealthy impressions which goes far to encourage the development of the phthisical disorders. In children born of consumptive parents, the chest is very commonly misshaped in the manner described.

There is a third variety, which is a form of the pigeon-breasted thorax. It may be found in a healthy child born of a family without consumptive history, and is not distinctive of a phthisical tendency, although it usually indicates a special sensitiveness to alternations of temperature. This variety is the result of repeated catarrhs affecting the lower lobes of the lungs during early childhood. The catarrh raises an impediment to a full inspiration; and, therefore, at each descent of the diaphragm, the inferior ribs are driven inwards, for the lower lobes of the lungs are insufficiently filled with air. This forcing inwards of the ribs carries the lower end of the sternum forwards, and changes the horizontal section of the chest at that point from an ellipse to a triangle. The sides of the chest over the lower ribs are flattened, and the sternum protrudes more or less according to the height to which the impediment to the entrance of air extends into the bronchi. If the catarrh be long continued or return repeatedly, a certain amount of permanent collapse is induced in the lower pulmonary lobes, and the deformity of the chest becomes a lasting one. This variety of pigeon-breasted thorax is distinguished from the pigeon-breast so common in rickets by the different shape of the upper part of the chest in the two diseases. In rickets, where all the ribs are soft, the whole sternum projects, and the chest is furrowed laterally as high as the second rib. In the case we are considering, the protrusion is confined to the lower end of the breast-bone, and the retraction of the ribs to the infra-mammary region; while, at the upper part, the chest is flattened from before backwards.

Although pulmonary phthisis is often seen in connection with a misshapen chest, it does not follow that a consumptive child must necessarily exhibit any such peculiarity.

Phthisis, unfortunately, is not confined to children who inherit a pulmonary weakness. In early youth, as in after life, a serious amount of disease may exist in a chest which presents to the eye every appearance of health.

Morbid Anatomy.—Whatever opinions may be held as to the nature of the phthisical process—whether it is primarily "tubercular" or not—there can be little doubt that in the majority of cases of consumptive disease the destructive action is the direct result of catarrhal changes. Therefore, the morbid appearances found in the lungs after death from phthisis, consist chiefly in the presence of caseous masses, which, according to the stage reached by the disease, may be firm and solid, or softened, or more or less disintegrated and broken down.

The catarrhal process to which the caseous masses owe their origin, may be acute or chronic. Usually it is the latter. The consolidation resulting from an acute attack of catarrhal inflammation is absorbed, as a rule, with little difficulty; but when the inflammatory process is slow, the deposit is less likely to be removed. Indeed, in the majority of cases, pneumonic phthisis owes its origin to a chronic catarrhal inflammation, which fixes itself in the small air-tubes and the vesicles of the lung.

In children, a catarrh passes readily from the larger to the smaller air-tubes, and from these latter to the alveoli. The epithelial elements in the child's lung are more irritable than they become later in life. The cells are larger; they contain more protoplasm; and are less firmly adherent to the alveolar surface. Under the influence of catarrh, the mucous membrane pours out a tenacious thick fluid crowded with corpuscular elements. This viscid secretion plugs up the smaller bronchi, causing collapse of the vesicles to which they lead, and the corpuscles permeate the walls of the air-tubes. In the vesicles themselves, the cells composing the epithelial lining swell up and separate from the wall and from one another. Their nuclei divide; an active corpuscular proliferation sets in, and large spheroidal cells containing vesicular nuclei are produced which fill up the alveolar cavity.

The collapsed state of the air-cells in the affected part often causes the production of a compensatory emphysema in the tissue around; but the pathological lesion more commonly met with is a cylindrical dilatation of the minuter bronchi, especially of their alveolar terminations. The dilated tubes are not thickened as we see in cases of ordinary bronchial dilatation, but are, on the contrary, thinner than natural. In extreme cases the tube wall may be converted into a thin glistening membrane. The collapsed vesicles themselves usually become congested, and, as a consequence of the congestion, there is œdema. At this period absorption is still possible, and the appearance of the affected parts is that of dark reddish-brown patches, smooth and moist to the touch and of doughy consistence.

If absorption do not take place, caseation sooner or later sets in. The accumulation of cells continues, and as they cannot be expelled, owing to the plugging of the bronchi, they compress each other, and also the blood-vessels which ramify on the alveolar wall. As a consequence, the circulation there is arrested, and nutrition is impaired. The cells atrophy and undergo a partial fatty change, which can be at once detected by mere inspection of the deposit; for the centre of the mass becomes yellowish-white, and loses its transparency. At the same time the pulmonary tissue at the seat of disease is itself destroyed; the elastic fibres and the coats of the larger arteries alone escape, and may be detected as such at a later stage, when softening occurs in the deposit.

The caseous masses may occupy any part of the lung. They may be seen on the surface as flattened plates—extending inwards for some distance into the substance of the organ, and having a notched irregular circumference; or in the interior as rounded nodules. The nodules are often surrounded by a zone of reddish-grey glutinous infiltration, and the pulmonary tissue intervening between them is seldom healthy; usually it is œdematous, or more or less congested and collapsed; sometimes it is merely emphysematous and pale. The part of the lung occupied by the deposit is often determined by the way in which the caseous mass originated. When it occurs as the result of a chronic catarrhal process, it is seated almost invariably at the apex; but in cases where it is left as a consequence of an acute pneumonic attack it is often found at the base. In the beginning only one lung is affected as a rule; but when softening invades the cheesy mass, deposits usually begin to appear in the apex of the opposite lung.

When a section is made of a caseous mass, the surface is found to be dry, of a straw or grey colour, and sometimes marked with streaks or spots of black pigment. The fracture is granular; and the substance breaks down more easily in proportion to the newness of its formation, for as time goes on, the material is found to become tougher and denser, less granular and more opaque. Sometimes the lobules, by coalescence of which the mass is formed, can be distinctly traced out, depressed intersecting lines being seen, which are the areolar partitions separating the lobules from one another.

When the process of caseation is completed re-absorption of the mass, although not impossible, is scarcely to be looked for. The consolidating material does not however necessarily at once disintegrate and break down. It may remain unchanged for a considerable period, and if originally of small extent, may become in time calcified by the deposition of earthy salts, and encapsuled by the formation around it of a firm fibrous sheath. Larger caseous masses may become converted into fibroid tissue.

The first of these transformations is equivalent to a cure; the second, although less complete in its results, is still a favourable change, but it has its own special dangers, as will be afterwards described.

Softening, the most common termination of a cheesy deposit, always begins in the centre of the mass. The mere addition of fluid to the caseous nodule loosens the dead shrunken cells and the molecular *debris* around them, and converts the cheesy matter into a soft pulpy pus. This perforates the wall of the afferent bronchus, which lies in the centre of the nodule, and is expectorated, leaving a cavity in the lung tissue. Small fragments of cheesy matter found in the sputum present under the microscope particles of elastic tissue and shrunken cells, and their existence in the expectorated matter is a sure sign that active disintegration is still going on. Moreover, in the matters expectorated, and in the disintegrating cheesy detritus contained in the cavities, tubercle bacilli are usually to be found. In some cases these are isolated and few in number; in others they are numerous and are arranged in groups and masses.

Softening occurs early in proportion to the size of the mass and the rapidity with which it has been formed. Small nodules formed slowly may remain indolent for many months, and, indeed, often undergo calcification. When softening begins, it usually attacks first the nodules seated at the upper part of the lung. This is not, however, a constant rule; for sometimes, as in cases of "acute phthisis," general softening attacks at once all the solidified patches of tissue, so that the lung becomes riddled with cavities which communicate with one another.

The occurrence of softening is usually a signal for the appearance of secondary changes in other parts of the body. The apex of the opposite lung, hitherto unaffected, now begins to be invaded by secondary deposits. The alimentary canal also becomes implicated. Peyer's patches and the solitary follicles in the neighbourhood of the ileocæcal valve become the seat of a cheesy degeneration, due to a proliferation within them of corpuscular elements. The diseased follicles soften from within outwards, and burst, leaving a sharply circumscribed ulcer. This spreads, so as to form an oval ulcer, placed transversely across the axis of the bowel. The process by which it extends itself is the same as that by which it originated, viz., a caseation and softening of the tissues swollen by corpuscular infiltration.

In the large majority of cases of pulmonary phthisis the disease is pneumonic from the beginning, and is a result simply of an inflammatory process occurring in a constitution predisposed to caseous degenerations. The disease, however, seldom remains purely pneumonic until the close. The occurrence of softening is often the signal for the appearance of the grey granulation in and around the affected part of the lung, constituting a localized tuberculosis; and often, as the consumptive disease becomes more advanced, a general secondary tuberculosis may be established, which is the cause of widely distributed pathological lesions.

In some cases the phthisical disease is from the first marked by the presence of the grey granulation, and begins with a chronic formation of tubercle in the lung. In this insidious and fatal form of the complaint, the part first affected is almost always the apex of the lung, and it usually happens that the two sides of the chest are attacked at the same time.

An aggregation of small miliary nodules, grey, translucent, tough and elastic, takes place in the septa between the alveoli, in the peribronchial tissue, and beneath the mucous membrane. These nodules do not fill up the air-cells from within, but compress them from without. As a consequence of this pressure the air-cells become almost or entirely closed, the supply of blood to the part is interfered with, and nutrition is impaired. Softening and breaking up of the new formation follow.

Beginning at the apex, the disease spreads downwards, involving more and more of the lung, the area of consolidation being in many cases increased by catarrhal pneumonia and its resulting cheesy deposits. But tubercular consolidation does not always set up inflammation in the lung tissue around. In some cases we find a purely tubercular solidification, unaccompanied by any proliferation of cells in the alveoli, spreading slowly over the lung, and slowly disintegrating and breaking down.

Besides the pathological alterations which have been described, there is another variety of pulmonary phthisis which is found in children as well as in adults. This is fibroid induration or cirrhosis of the lung. The septa between the alveoli become thickened by a dense formation of fibroid tissue, which forms an interlacing network and spreads in all directions through the diseased part. The shrinking of the new fibroid material causes contraction of the lung and dilatation of the bronchi. The whole lung is therefore diminished in size, but the affected part in particular is especially shrunken, and is dense and slate-coloured. A section is hard, firm, and smooth, with a shining surface, on which are seen whitish bands intersecting one another and forming a coarse network; and the mouths of thickened bronchial tubes—some dilated, others contracted and nearly obliterated, by the new fibrous tissue. The fibrous bands often enclose spaces filled with yellow cheesy matter, the result of accompanying catarrhal pneumonia. This may be softened, or even broken down into cavities, constituting the "fibroid phthisis" of Sir Andrew Clark.

Symptoms.—There are certain general symptoms which are common to all forms of pulmonary phthisis. In all of them nutrition is found to suffer. The child looks pale, loses his spirits, and becomes listless and languid. His appetite is capricious, and digestion is difficult and slow. He wastes with more or less rapidity; is feverish in the night and often in the daytime, and is troubled with frequent cough. But while these symptoms are met with in all forms of consumption of the lungs, in different varieties of the disease they are found to vary greatly in intensity, and in particular cases single symptoms may be absent for weeks or months together. Thus, nutrition is interfered with much more strikingly in some cases than in others. In chronic tubercular phthisis, wasting takes place early, and the loss of flesh is rapid and extreme; while in fibroid induration of the lung, unless the disease be far advanced, or be complicated by an intercurrent inflammatory attack, nutrition may go on fairly well, and the weight of the body be but little reduced. Pyrexia, again, a constant symptom in tubercular consumption, often subsides for a time in the catarrhal form, and in cases of uncomplicated fibroid induration may be absent altogether.

Cough is usually one of the first signs to indicate any affection of the lungs; but in pulmonary phthisis it may be comparatively rare, and excite little notice until the disease has become considerably advanced. In the beginning slight, dry, and short, it becomes after a time moister and more prolonged; but however loose the cough may be, it is seldom in children under seven or eight years old accompanied by expectoration, unless vomiting occur, as such children almost invariably swallow the sputum as it reaches the mouth. If, however, the cough produces vomiting, large quantities of purulent mucus, more or less thick and viscid, may be expelled. In cases of fibroid induration of the lung, with much dilatation of the bronchi, the cough may assume a convulsive character, like the cough of pertussis, but without the whoop. The paroxysms occur at long intervals, and end in violent retching efforts, during which large quantities of muco-purulent sputa are ejected. Such sputa are often very viscid and stringy, and have a very offensive smell, owing to long retention in the dilated air-tubes.

Hæmoptysis is a rare symptom, as the blood, like the phlegm, is almost always swallowed. Sometimes, however, severe hæmorrhage may occur at a late stage of the disease, causing death. This is seldom seen except in cases complicated with great enlargement of the bronchial glands. In infants a discharge of blood from the lungs is hardly ever seen. In children of seven years of age and upwards, the sputa may be streaked with blood; but hæmoptysis, in the ordinary sense of the word, is uncommon, and, when it occurs, is seldom considerable.

The respirations are usually increased in rapidity, rising often to thirty, forty, or even more in the minute. This acceleration is not necessarily accompanied by any feeling of dyspnœa, and unless the structural alterations occupy the greater part of both lungs, is seldom the cause of any discomfort to the patient. The rate of breathing is always quickened by the presence of pulmonary catarrh, and is largely influenced by the temperature of the body. An increase of heat necessarily hastens the rapidity of breathing, for more carbonic acid is formed, and more oxygen is required. Rapid breathing may also be an early sign of tubercle, in cases where the physical signs are as yet unaffected. If unaccompanied by percussion-dulness, or bronchial breathing, it is said, by Niemeyer, to be one of the first and most important symptoms of tubercular phthisis. Also, if in an advanced case of phthisis the breathing suddenly becomes rapid, without any addition to the physical signs, or any increase in the pyrexia, we may strongly suspect that tubercles are complicating the case.

Vague chest pains, and uneasiness about the shoulders, are sometimes complained of by children, and if complained of spontaneously are of some importance. Such pains are more common in the pneumonic variety of phthisis than in the other forms. They seldom last long at a time, but disappear and return irregularly.

When the disease is advanced, the appetite often fails, but not always; it may continue good almost to the last, and the more chronic the case, the more likely is the appetite to be preserved. A considerable degree of pyrexia does not necessarily destroy this relish for food—at any rate amongst hospital patients; and it is not unusual to see a child eating his meals, apparently with full enjoyment, although his temperature at the time may be 102° or 103° Fahr. The habit of swallowing the sputum is, no doubt, a frequent source of derangement of the stomach; and loss of appetite, with looseness of the bowels, and other digestive troubles, must be frequently attributed to the irritation of acrid mucus thus imported from the air-tubes into the alimentary canal.

Attacks of diarrhœa are very common, and help greatly to reduce the weight, and increase the feebleness of the patient. If these attacks appear at a time when softening of a deposit is taking place, with ulcerative destruction of lung tissue, and continue obstinate in spite of remedies, they are probably due to ulceration of the bowels.

Emaciation in cases of phthisis does not proceed with any regularity. Sometimes, even in the tubercular form, the weight of the body may remain stationary for several consecutive weeks, or may even undergo a temporary increase; but such a favourable sign is exceptional, and seldom persists for long together. In cases of pneumonic phthisis wasting is by no means a constant feature. It is determined chiefly by the degree of pyrexia, the state of the digestive organs, and the presence or absence of inflammatory complications. But a considerable degree of fever will not necessarily cause emaciation if the appetite be good and the digestion active. It is not uncommon to see a child actually gain in weight, although the temperature stands every night between 101° and 102° Fahr., and although examination of the chest shows that the pulmonary mischief is continuing to extend itself. In fibroid induration of the lungs, which in an uncomplicated case is not attended with pyrexia, the amount of flesh appears to be dependent very much upon the state of the weather, and, consequently, upon the presence or absence of intercurrent inflammatory attacks. Children suffering from this form of consumption are generally found to lose in bulk during the winter when catarrhs are active, and to regain flesh upon the return of more genial weather, when their liability to cold is diminished.

In all cases of phthisis, a sudden increase in the rapidity of wasting combined with a rise in the temperature is a sign of the occurrence of some inflammatory complication. To an attack of intercurrent inflammation, death may be usually attributed; but sometimes it is a consequence of long-continued fever, sleeplessness, and mal-nutrition. In such cases the child gets gradually weaker and thinner, and at last can hardly be persuaded to sit up in his bed even to take food. His appetite fails completely; aphthæ appear upon the tongue, gums, and inside of the cheeks and lips; the lower limbs become œdematous from the impoverished state of the blood; and death ensues, often preceded by very distressing dyspnœa.

While the above symptoms are common to all forms of consumption of the lungs, the mode of beginning and the course of the disease differ considerably in the several varieties.

In chronic tubercular phthisis, the beginning is gradual. From the first the general health suffers, and throughout the general symptoms are severe. The mother usually complains that the child has been lately growing languid and dull; that his appetite has failed, and that he is losing flesh. He is often feverish at night, and is troubled at times with a short cough. Cough in such cases is always a late symptom, and is preceded by signs of general disturbance of health.

The course of the disease is comparatively rapid, and, in ordinary cases, its end may be expected within eighteen months of the first appearance of the physical signs. The child continues to waste. Pyrexia is usually persistent, and is accompanied by morning sweats. There is little desire for food. The digestive organs are weak and irritable: vomiting is frequently excited by cough, and the bowels are disposed to be relaxed. The voice sometimes becomes hoarse from ulceration of the larynx (laryngeal phthisis); but this symptom is less common in young subjects than it is in the adult. At length the child dies exhausted, or falls a victim to an intercurrent attack of pulmonary or meningeal inflammation.

The pneumonic form of phthisis may either follow an acute attack of inflammation of the lung, or may begin more insidiously by the extension of a catarrh from the smaller tubes to the alveoli. In the first case convalescence is slow and uncertain. The pyrexia does not subside as usual, or, if the temperature falls at first, it does not long remain natural, but after a few days the child is noticed to be again feverish at night. The cough continues; and, in children who are old enough to expectorate, the sputa may be seen to be streaked with blood, although this is exceptional. Nutrition, however, may go on fairly well, and the patient often regains weight, or at any rate at first does not sensibly emaciate. Such symptoms show that the unabsorbed mass left after the attack of inflammation of the lung has undergone cheesy degeneration, and is acting injuriously upon the tissue around, setting up an irritation which, if continued, will lead to breaking down of the deposit. But it must be remembered that these symptoms do not always follow an attack of pneumonia, in cases where the consolidating material has failed to be re-absorbed. So long as a cheesy mass remains indolent it may give rise to no symptoms at all. In such a case, in young subjects, we may still hope for its removal, even after the lapse of a time which would have rendered so favourable a result in the adult impossible.

The occurrence of softening is usually marked by a sudden increase in the severity of the general symptoms. The face flushes; there is fever at night, followed by morning perspirations; the languor and weakness are increased, and the expression of the child becomes distressed and careworn.

In cases of slow development of pneumonic phthisis, the extension of a catarrh to the alveoli from the smaller tubes is shown by a rise in the temperature. The child begins to be feverish at night. His breath becomes short. His cough is more frequent, drier, harder, and more distressing, and, if there is any expectoration, the phlegm may be streaked with blood. These special symptoms, indicating lung irritation, may persist for a considerable time without any signs being noticed of general impairment of nutrition. At length, however, the appetite fails, digestion suffers, nutrition is interfered with, and the child wastes perceptibly. The physical signs which accompany this state of things will be considered afterwards, but it may be mentioned here that although apparently trifling, they are not the less important, and must not be overlooked.

Should secondary acute tuberculosis come on, all the symptoms are aggravated. Wasting proceeds with rapidity; the feebleness increases; appetite is completely lost; and there is often great irritability of the digestive organs, with vomiting or diarrhœa. The cough becomes more distressing, and the child breathes quickly, and often painfully from the occurrence of dry pleurisy. Death may be preceded by squinting, inequality of pupils, convulsions, rigidity of joints, and other symptoms indicating an advanced stage of tubercular meningitis.

In cases of *fibroid induration* of the lung, there may be little about the child to excite attention so long as the disease remains in an early stage. Any symptoms which may occur are the result merely of the catarrhal attacks to which such a condition of the chest renders the child peculiarly prone. In the interval of such attacks, the cough disappears, the appetite returns, and the health and strength generally appear to be satisfactory. It is when an increase in the cirrhosis has led to contraction of lung and dilatation of bronchi that the symptoms become characteristic. The dilated rigid tubes tend to retain their secretions. There is consequently a great accumulation of sputum, which putrefies, and is only with great difficulty evacuated. The cough occurs at rare intervals, in paroxysms lasting ten or twenty minutes, or even longer, during which the face is suffused, the eyes become red and watery, and the whole appearance is suggestive of a severe fit of whooping-cough. At the beginning of the paroxysm there is no expectoration, but, after a time, stringy muco-purulent matter begins to be discharged; and the fit often ends in violent retching efforts, and the expulsion of large quantities of fetid sputum. Areolar fragments of elastic tissue, showing ulceration of lung, may be often detected microscopically in the expectorated matter.

Owing to the indurated and contracted state of the lung, its circulation is more or less impeded. In bad cases there is, therefore, some hypertrophy of the right side of the heart, and a prominence of the superficial veins in the neck, chest, and limbs, which indicates an abnormal fulness of the systemic venous system. The fingers soon become clubbed; and the face has habitually a congested turgid appearance, especially when the patient is suffering from a superadded catarrh.

There is no pyrexia unless catarrhal pneumonia, or ulceration of the bronchial tubes, be present, as in the stage called fibroid phthisis. In an uncomplicated case of fibroid induration the temperature is natural, and, perhaps as a consequence, the digestion and appetite are good as a rule, and the appearance of the child is fairly robust. But, after the disease has existed for some time, the constant drain upon the system, produced by the copious purulent discharges from the lungs, very commonly gives rise to amyloid degenerations. The liver and spleen become enlarged, and there is often albuminuria with œdema of the extremities. Moreover, the extension of the disease in the lung, and the occurrence of ulceration (fibroid phthisis), prove additional sources of weakness, undermining the strength of the patient. Consequently, in the later periods of the disease, the child becomes thin, haggard-looking and feeble. His debility is increased by attacks of diarrhœa; and, if he be not cut off by an intercurrent pneumonia, he becomes more and more prostrated, and eventually dies worn-out and exhausted.

Physical Signs.—When in a case of pulmonary consumption evident physical signs of the disease can be detected, the information thus obtained supplements and confirms that already derived from a consideration of the general and special symptoms. It is important, however, that the two sources of knowledge should be considered together and compared. The evidence, obtained by a physical exploration of the chest, shows merely the presence of consolidation of the lung, of breaking up of the consolidating material and the formation of cavities—changes which may be the consequence of more than one variety of pathological lesion. A consideration of the seat, the course, &c., of these physical signs will, no doubt, often help us to a diagnosis; but often also we have to refer to the symptoms which announced the beginning of the disease, and accompanied its development, before we can arrive at a complete understanding of the nature of the case.

An examination of the chest in a child must be conducted with as much care as if the patient were an adult. To do this effectually it is important that he be so placed as to occasion no difficulty or discomfort to the observer. Infants can be held up in the nurse's arms, or be raised up to a convenient height by laying them upon a cushion placed upon the table. Older children may be seated upon a table or high music stool. In either case the patient should be completely stripped to the waist.

In young subjects the physical signs present certain peculiarities which it is important to be prepared for. Thus, vocal vibration is generally altogether absent, both in health and in disease, and, even if present, is not to be relied upon as a help to diagnosis. Again, the chest in a young child is exceptionally resonant, and it is not always easy to detect variations in its sonoriety. A great mistake often made in the examination of children, consists in using only one finger as a percussor. By using two fingers we can equally moderate the force of the blow, while at the same time we elicit a far greater volume of sound. An amount of dulness which escapes the ear, when percussion is made with only one finger, can often be readily brought out when two fingers are employed. At the apices dulness is best detected in infants and young children at the supra-spinous fossæ, and can often be discovered at these spots when in front the percussion note is perfectly healthy. Great care must, however, be taken to exclude all sources of fallacy in estimating the degree of resonance of the apices. One shoulder higher than the other, or a cramped position, bringing the muscles attached to the shoulder into action, will produce a dull sound on percussion, which is not due to the condition of the lung. In infants, in examining the supraspinous fossæ, it is advisable to place the child, stripped to the waist, on the nurse's left arm, so that his head and right arm hang over her left shoulder, the left arm of the child being round his nurse's neck. In this position the muscles of both sides are relaxed, and if the child remain quiet the results of percussion may be relied upon. Percussion should be made upon the two sides at the same period of the respiratory movement. Thus, if one side has been percussed during inspiration, it will be necessary to wait until another breath is taken before subjecting the opposite side to the same test. On account of the readiness with which false conclusions may be drawn with regard to the degree of resonance of the lung in children, it is best to require a considerable amount of dulness on percussion before making any positive inference from the examination. Slight differences between the two sides should be allowed little weight, for a spot which appeared to be dull at one visit, may on the next seem perfectly healthy, the difference probably depending upon various degrees of expansion of the lung tissue at that spot.

The dulness, although often situated at the apex, is not necessarily so. The whole chest should be carefully percussed both at the back and at the front. Dulness may be found in spots separated by tissue which yields a normal resonance, or may be limited to an area in the middle of the lung or at the base. In fact, wherever catarrhal pneumonia may have occurred about the lung, a deposit may be left to impair the natural resonance at that spot.

Of the varieties of the percussion note little need be said. To the tubular note no importance can be attached; and the "cracked-pot" sound is a natural phenomenon if the chest be percussed during expiration, or when the mouth is open.

In practising auscultation we must remember that coarseness and harshness of the respiratory murmur (puerile breathing) is a natural condition in the child, and that expiration is often prolonged, especially at the apices, without its being necessarily a sign of disease. Even from differences in respect to loudness and coarseness on the two sides we cannot prudently draw any positive conclusion. When, however, the *pitch* of the breath-sound is raised on one side, we may rely upon such a change as evidence of disease, and may expect the respiration to become distinctly bronchial in the course of a few days.

Even when the breathing at a particular spot is bronchial or hollow, we have still to satisfy ourselves that the abnormal quality is not conducted from the throat or primary divisions of the air-tubes. In children who suffer from enlarged bronchial glands or swollen tonsils, and even in some children who in such respects show no sign of disease, sounds from the large bronchi or the pharynx are conducted readily to the chest, and loud hollow breathing may be heard at the apices of perfectly healthy lungs. On this account it is important that, if possible, the child's mouth be open during the examination, as pharyngeal sounds are then less easily transmitted.

On account of this ready passage of extraneous sounds to the chest, the use of the stethoscope is imperative to insure accuracy of observation, as it is only by such means that we can limit the area under investigation and examine the lungs, so to speak, bit by bit. If the instrument is spoken of as a "trumpet," children who are old enough to understand the term, seldom manifest much opposition to its use, especially if they are allowed to touch and play with it beforehand; and infants in whom the chest disease is extensive are often remarkably quiet during examination, being usually too much occupied by their own sensations to make any resistance to the operation. Over the seat of dulness the respiratory murmur is either weak and suppressed, or is bronchial, blowing, or cavernous, with increased resonance of voice and cry. As the tissue softens and breaks up, moist crackles are heard accompanying the breath-sounds, or there is merely a click or two at the end of inspiration. This passes, as cavities form, into gurgling, or large bubbling rhonchus, more or less metallic.

The stethoscopic signs differ in value according to the part of the chest at which they are heard. At the apices mere harshness of respiration is insignificant, and prolonged expiration absolutely worthless as a means of diagnosis. Bronchial breathing is a natural condition between the scapulæ over the site of the principal divisions of the air-tubes; and at the apices may be closely simulated by sounds conducted from the pharynx and large bronchi. If this conduction can be excluded, bronchial breathing heard at the supra-spinous fossæ is often the sign of a cavity. In the case, however, of bronchial blowing and cavernous breathing, enlarged bronchial glands in contact on one side with the air-tubes, and on the other with the chest-wall, may, by their conducting power, simulate these varieties of respiration so closely, that from a single examination it is often impossible to give a positive opinion as to the condition of the lung. It is only by a careful observation of the succession of these sounds that a conclusion can be arrived at. In the case of pulmonary consolidation and excavation the breathing becomes more and more distinctly metallic and cavernous, while—if the sounds are due to conduction—cavernous, bronchial and harsh breathing will be found to alternate irregularly with one another. Bronchial respiration is therefore more significant of consolidation when heard at the base of the lung than at the apex. The same may be said of feeble breath-sounds; although merely weak breathing is so common in young persons at all parts of the chest, from insufficient expansion of the lung, that at a first examination too much importance should not be attached to it. If it be found to persist for several weeks, or if it occupy the whole of one lung from apex to base, it becomes a sign of considerable value.

Cavernous breathing combined with dulness, gurgling rhonchus, and increased resonance of the voice and cry, usually indicates a cavity near the surface of the lung. But in every case where these signs are met with, we must not hurry to the conclusion that the lung tissue is excavated at that point. At the apex such breathing may be simulated closely, as we know, by sounds conducted from the air-tubes; and at the base it is by no means to be accepted in every case as a sign of ulcerative destruction of lung. Cavernous respiration heard at the lower lobe of either lung is more commonly the consequence of bronchiectasis than of a cavity; but it may be also detected in cases where the sole pathological lesion present is a copious pleuritic effusion. The distinction between these conditions will be considered under the head of diagnosis.

In the different forms of pulmonary consumption, the course of the physical signs is often fairly expressive of the nature of the disease.

In chronic tubercular phthisis signs are late to appear, and at first may easily escape notice. Often, indeed, the slight evidence of disease obtained by a physical examination of the chest in a case where the severity of the general symptoms had attracted much attention, excites considerable surprise. A child who is described as having ailed for over three months, with hollow cough, evening fever and loss of flesh and strength, may present on examination merely a slight want of resonance at the apices of the lungs, with weak harsh breathing, and an occasional click in inspiration, changing to a faint dry crackle after a cough. In this variety, although one-half of the chest is first attacked, the opposite side becomes affected after a short interval; and usually by the time any positive physical signs are present, they are discovered at both apices. In most cases inflammation is soon excited in the part, and a secondary catarrhal pneumonia is set up which produces marked dulness and all the signs of consolidation. When this occurs, the existence of grey tubercle as the original factor in the disease may be overlooked; although the presence of mischief in both lungs, and the severe general symptoms, combined with a history of the beginning of the attack, should make the nature of the illness a matter of the strongest suspicion.

Sometimes the tubercular disease remains uncomplicated with pneumonia. Disorganization then goes on slowly: the breath-sound, although still feeble, becomes gradually blowing in quality, and eventually, all the signs of a cavity are discovered at one apex. It is, however, rare for the inflammatory element to be absent. Far more frequently the disorganization of the lung is effected through the breaking down of pneumonic cheesy matter. The signs are then much more marked, and are consequently more easily recognizable.

When a *pneumonic phthisis* begins by the gradual extension of a bronchial catarrh to the alveoli, the earliest signs are discoverable at the apex of the lung. There is some loss of resonance on percussion; the respiration is high-pitched or faintly bronchial, and a click or dry crackle is heard at the end of a deep inspiration. These signs may be discovered either at the front or at the back: perhaps it is most common to meet with them first at the supra-spinous fossa. Soon, however, they begin to be noticed also above the clavicle. Thenceforth, unless measures be taken to counteract the evil, the progress of the disease is more rapid, and it is not long before evident signs of consolidation are found at the apex of the lung on one side of the chest. In this form of pulmonary phthisis, the physical signs appear early and precede any marked symptoms of general impairment of health. Such cases offer therefore a remarkable contrast to the tubercular variety of the disease which has just been considered.

When the phthisis results from an unabsorbed deposit left after an attack of acute catarrhal inflammation, its situation is indicated by percussion-dulness, and all the usual signs which accompany a solidification of the lung. In such cases, the apex is not necessarily affected; indeed, it is the exception to find the upper third of the lung involved in the disease. Far more commonly the signs are discovered at the base or in the middle third; and, therefore, in a physical examination of the chest, every part should be thoroughly explored. But, here again it is to be remarked, as in the former case, that, until the disease is far advanced, the physical signs often indicate a greater amount of mischief than a consideration of the general symptoms would have led us to expect.

When softening takes place in the caseous mass, wherever this may be situated, attention should at once be directed to the apex of the opposite lung. A careful examination will probably detect a rise of pitch in the breath-sound at this point, with one or two faint clicks in inspiration, and, possibly, some diminution of resonance on percussion. As the softening process advances, these signs of secondary lesion become more and more manifest; and by the time a cavity has become established at the original seat of disease, the apex of the lung, on the other side of the chest, usually furnishes distinct evidence of consolidation.

In fibroid induration of the lung the physical signs are limited, usually throughout, to one side, and may be found at the upper part of the chest, or at the base. In an early stage, little more is noticed than a wooden quality of percussion note, with slightly increased resistance, and harsh bronchial breathing. If there be accompanying catarrh, some coarse bubbling, or crepitating rhonchus may be caught here and there about the chest and back.

Vocal fremitus, if present on the sound side, cannot be felt over the affected part ; but the resonance of the voice at first is normal.

As the disease proceeds, the lung becomes contracted ; the bronchi dilate ; and the chest falls in. On account of the diminished size of the lung, the circumference of the side is reduced. The chest is flattened at the seat of disease, and the heart and mediastinum are drawn towards the affected part. The apex-beat of the heart is, consequently, displaced, and the resonance of the opposite lung passes across the middle line of the chest. There is little respiratory movement over the indurated lung, and vocal vibration is usually completely absent.

The percussion note is wooden or tubular, with, in many cases, marked sense of resistance. The respiratory sounds vary according to the amount of secretion contained in the tubes. If there be much accumulation, the breathing is weak and bronchial, with little rhonchus, and but faint resonance of the voice. If, on the contrary, the dilated tubes are nearly empty, the respiration is loud and cavernous, with much clicking rhonchus mixed up with creaking sounds, and vocal resonance is intense and bronchophonic. As a rule, attacks of catarrhal pneumonia are frequent. The area of dulness is then extended, and to the stethoscope the breathing is almost obscured by profuse, loud metallic crepitation.

CHAPTER IX.

CHRONIC PULMONARY PHTHISIS (*continued*).

Diagnosis.—Of chronic tubercular phthisis—Of pneumonic phthisis—Its complication with grey tubercle—Of fibroid induration of lung and fibroid phthisis—Diagnosis of pulmonary cavities—From empyema—From dilated bronchi.
Prognosis.—Varies according to the form of phthisis.—Mode of ending.
Causes.—Of tubercular phthisis—Of pneumonic phthisis—Of fibroid phthisis.
Prevention.—Diet and general hygiene.
Treatment.—Climate—Exercise—Diet—Attention to digestive organs—Drugs.

Diagnosis.—In the diagnosis of pulmonary phthisis, we have first to satisfy ourselves as to the pathological variety of the case before us, and then to determine the stage at which the disease has arrived. The task of classification is, however, not always an easy one, for the types of disease seldom remain separate and defined. On the contrary, they are apt to run into one another, and blend together, so as, in a great measure, to lose their distinctive characters. In all cases the chief point to decide is the presence or absence of grey tubercle, for this may exist alone (chronic tubercular phthisis), or may be conjoined with other pathological conditions.

In uncomplicated *chronic tubercular phthisis* the physical signs are slight at the first, and involve the apices of both lungs. In a well-marked case resonance is impaired; there is bronchial breathing; and at the end of deep inspiration a faint crackle is heard, which becomes louder, and more distinctly crepitating after a cough.

These signs found at the apex on both sides of the chest, and continuing unchanged for several weeks, afford the strongest suspicion of the presence of grey tubercle.

In many cases the signs are much less clearly defined, and it is often impossible at the first, or even after several successive examinations, to come to any positive conclusion as to the exact nature of the illness. To arrive at a diagnosis, we must take into account the family history, the special history, the conformation of body, and the general symptoms of the disease. Thus, if a child born of consumptive parents, and whose general build corresponds to the type which has been described as significant of the tuberculous diathesis, becomes languid, and mopes; if he has irregular attacks of fever, loses flesh, complains of vague pains and oppression about the chest, and after a time begins to suffer from a short dry cough, we should suspect tubercular phthisis. If these symptoms have succeeded to an attack of measles or whooping-cough, our suspicions are strengthened; but so long as percussion of the chest shows no dulness, and auscultation reveals nothing but harshness of respiration at the upper part of the lungs, with an occasional sibilant or sonorous rhonchus here and there about the chest, we should still hesitate to give a decided opinion. When, however, resonance at both apices becomes impaired, and bronchial breathing is heard with a faint, dry crackle at the end of inspiration—these signs, taken in conjunction with the suspicious general symptoms, can leave little room for doubt.

In cases where from the ill-defined character of the physical signs we had been obliged to reserve an opinion as to the condition of the apices, the occurrence of double pneumonia at these spots throws considerable light upon the difficulty, and greatly increases the probability that the disease is tubercular.

At a later stage, when the tubercular disease has become complicated, and secondary catarrhal pneumonia has greatly extended the limits of pulmonary consolidation, it would be difficult, perhaps impossible, from a consideration merely of the physical signs to detect the tubercular origin of the disease. We may, indeed, exclude grey tubercle if the apices of both lungs are unaffected; but if, as usually happens in cases of pneumonic phthisis when pulmonary disintegration is going on, both apices are involved, we cannot solve the question by mere physical examination. In such a case an accurate account of the child's illness is of the utmost importance, and from the history, the more rapid course of the complaint, and the greater severity of the general symptoms, we may often be justified in inferring that the case is not one of ordinary pneumonic phthisis, but that it took its origin in tubercular formation at the apices of the lungs.

In *pneumonic phthisis* we can often succeed in discovering a distinct period at which the first symptoms were noticed. A child delicate, perhaps, but in his usual health, is seized with an attack of vomiting, followed by fever, cough, and general chest symptoms. The strength is not much reduced, and the breathing is but little oppressed, although it may be rather more hurried than natural.

If the child be seen early, no dulness may be found on percussion, but there is more or less coarse crepitation heard at a certain part of the chest, usually at one or the other apex—seldom at both if the disease be uncomplicated. The crepitation accompanies the expiration as well as the inspiration, and varies greatly in amount from day to day; sometimes more being heard, sometimes less, and sometimes for a short time it is completely absent. If any dulness be present, it is slight at first, and may not become more marked for several weeks. The breath-sounds are not necessarily altered in character. The temperature of the body rises at night to 102° or 103° Fahr., falling in the morning to about its natural level.

After a time, often only after several weeks, the dulness becomes more marked, and then gradually increases in intensity and extent; the respiration is bronchial or tubular; and the coarse crepitation, persisting, is heard over the whole of the consolidated part, but varies in amount as before, and occasionally is replaced for a time by a rhonchus of larger size. Eventually the percussion-note becomes tubular, and there is cavernous respiration with gurgling.

An attack of subacute catarrhal pneumonia, such as the above, running a tedious course, and leaving behind it an unabsorbed caseous mass, often ends in pulmonary consumption. The cheesy matter after a time softens and disintegrates, or the part becomes thickened with new fibroid tissue, and permeated with dilated bronchi. Disease thus induced may affect any part of the lung, but is usually confined to one side of the chest—at any rate, at first.

Pneumonic phthisis may, however, have a much more insidious beginning. In cases where a pulmonary catarrh spreads gradually from the larger to the smaller air-tubes, and from these to the alveoli, the main features of the disease present a strong similarity to those present at the beginning of chronic tubercular phthisis; and it is necessary to make very minute inquiries to establish the difference. One of the chief points of distinction lies in the influence of the illness upon nutrition. In tubercular phthisis the general symptoms precede the special. Wasting and fever are present from the beginning. The child loses weight rapidly, and his haggard appearance attracts attention. It is only after a very distinct interval that he is noticed to cough. In chronic catarrhal pneumonia exactly the opposite conditions prevail. The special symptoms are the first to appear. Cough and shortness of breath are remarked upon before any loss of flesh has excited observation, and although the temperature is higher than natural, it is long before any material impairment takes place in the nutrition of the child.

Physical signs, when present, are met with in tubercular phthisis, at both apices, but the comparatively trifling amount of structural change discovered by physical examination presents a remarkable contrast to the severe disturbance in the general condition, and forms an important element in the diagnosis. In pneumonic phthisis, on the contrary, the disease is at first confined to one side of the chest, and often proves on examination to be far more extensive than the well-nourished state of the patient had led us to anticipate.

Advanced pneumonic phthisis is often complicated with secondary acute tuberculosis. We may suspect this if we find great hurry of breathing, with an increase in the pyrexia, without any extension of the physical signs. There is usually also considerable irritability of the digestive organs with vomiting or diarrhœa. If in such a case convulsions occur with squinting, inequality of pupils, and other signs of intra-cranial disease, our suspicions are amply confirmed.

In *fibroid induration* or *cirrhosis* the disease is limited to one lung. The affected side is retracted, often considerably; the front of the chest is flattened, the respiratory movement slight, and the heart more or less displaced. If the disease occupies the left side, the heart is drawn upwards; if the right side, the heart is drawn towards the middle line. Real elevation of the heart must not be confounded with *apparent* elevation through unnatural obliquity of the ribs occurring in long-chested children. There is dulness on percussion over the seat of disease—usually the middle third of the lung approaching more or less to the apex. The note is often tubular, and there is unusual parietal resistance. Auscultation shows harsh, bronchial, or blowing respiration, with coarse rhonchus and increased resonance of voice, passing, as the bronchi dilate, into cavernous respiration, with gurgling and pectoriloquy. A systolic basic murmur is sometimes present, produced probably by pressure. There is no febrile disturbance, on the contrary the temperature is unusually low.

In extensive consolidation of the upper part of one side only, the other side giving no—not even the faintest—sign of disease, the diagnosis lies between pneumonic phthisis and fibroid induration. The existence of retraction of the affected side, the altered position of the heart, the flatness of the percussion-note, the great resistance, and the absence of fever, exclude the former disease. It is distinguished from chronic pleurisy with retraction by the resonance at the base, and by the signs of a cavity.

It is not always easy to satisfy ourselves as to the existence of a cavity in the lung, for, although present, it may give rise to no very positive signs, and again, although absent, the physical signs usually indicative of excavation may be present.

In infants, and children of three or four years old, the signs of a cavity are often very obscure, consisting merely in bronchial breathing with fine bubbling rhonchus and bronchophony. Here no positive opinion should be hazarded. It must be remembered, however, that at such an age ulceration of the lung is not a common condition.

In the case of older children, a dull, tubular, or tympanitic percussion-note, with gurgling and bronchophonic resonance of the voice—signs usually indicative of a cavity—may be produced by dilated bronchi, and are occasionally very closely simulated in some cases of pleuritic effusion. Empyema, indeed, is frequently mistaken for pulmonary phthisis, and the error is one which may be easily made. In many cases of empyema there is hectic fever, with wasting and great weakness: there is failure of appetite, irritability of the digestive organs, cough and shortness of breath. An examination of the chest shows extensive dulness, with blowing or cavernous breathing, and, often, a crepitating friction-sound which may bear a near resemblance to rhonchus in the lung. In cases such as these we can scarcely be surprised if the patient is supposed to be consumptive. But a little reflection should alter this opinion, and make us reconsider our diagnosis. The fact that disease in an apparently advanced stage is limited strictly to one side of the chest, should always excite our suspicions. If, then, we refer to the history of the complaint, and find that the illness began suddenly with pain in the side, followed, after a day or two, by cough; if we note the character of the physical signs, and remark that the dulness is complete with great sense of resistance; that it is found both at the front of the chest and at the back; and that however high it may reach upwards, it persists even to the extreme base below—we cannot but conclude that these features in the case are not reconcilable with what we know of pulmonary consumption, but must be referred to some other cause; and this cause there can be no doubt is pleurisy.

Whether the cavernous signs be due to a dilated bronchus or an excavation in the lung, it is not always easy to determine; but with regard to the ultimate issue of the case it is of the highest importance to make the distinction. A child after an attack of catarrhal pneumonia recovers flesh slowly, and remains feeble, with slight fever at night. An examination of the chest detects dulness and cavernous respiration, with large metallic bubbling rhonchus and bronchophony at the lower part of one lung. Here it is of the greatest moment to determine whether such signs are a consequence of a dilated bronchus, with surrounding consolidated tissue, or of an excavation in the lung. In the one case the child may be expected to recover completely; in the other a return to health can scarcely be anticipated.

If the signs are heard at the base, the probabilities are strongly in favour of bronchiectasis, especially if the apex of the lung is free from disease. If the area over which the abnormal signs prevail gradually increases in extent, our suspicions point to a cavity, for dilated bronchi usually remain unaltered, or tend to contract and become normal. Very valuable information is afforded by the general symptoms. If the patient improves, regains flesh and strength, with a good appetite, and a normal or only slightly elevated temperature, we may reasonably conclude that no lung disintegration is going on. In all cases, a careful examination of the sputum should be made with the microscope, if any expectoration can be obtained, to search for fragments of elastic tissue. Such fragments, if areolar, are conclusive evidence of ulcerative excavation. It is necessary, however, to make many examinations of the sputum before deciding against the presence of the elastic tissue.*

It is of course quite possible that the two conditions may be combined in the same lung, as we see in cases of fibroid phthisis, where ulceration has started from the wall of the dilated tube. In such cases we get the local sign of bronchiectasis combined with the general symptoms of pulmonary excavation. Thus, if the cavernous signs are heard at the middle or lower part of one lung, the apex of which is free from disease; if there be considerable retraction of that side, with displacement of the heart; and at the same time if, without any signs of secondary catarrhal pneumonia, we find a high temperature and general constitutional disturbance, the diagnosis of fibroid phthisis may be made without hesitation.

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* The search for elastic tissue is made a very simple process, by boiling the sputum in a test tube with an equal quantity of liquor sodæ. The mixture becomes perfectly clear, and fragments of elastic tissue, if present, sink to the bottom of the tube, whence they can be readily removed by a pipette.

The occurrence of ulceration is usually followed very quickly by secondary deposits in the apex of the opposite lung. Therefore, if in a case of fibroid induration we find any indication of disease in the apex on the other side of the chest, we should, from this sign alone, suspect the presence of ulceration.

Prognosis.—Pulmonary phthisis is generally fatal, sooner or later, but its course from bad to worse is not always uninterrupted. Great caution should then be exercised in making a prognosis, for a child who is apparently in the greatest danger may suddenly begin to improve, and his more serious symptoms may for the time completely disappear. Such amendment is apt to excite amongst his friends hopes, seldom destined to be realized, of a complete recovery.

This improvement often happens in cases where the local symptoms are temporarily aggravated by a bronchitic attack, but it may also occur in cases of apparently uncomplicated grey tubercle. When, however, the chronic disease is once fairly established, the apparent improvement is almost always speedily followed by a relapse, all the symptoms returning with increased severity. It is not always possible to obtain sputum for examination, for many children cannot be persuaded to expectorate the purulent matter brought up from the lung. If sputum can be obtained, the number and arrangement of the bacilli are said by some observers to be a measure of the rapidity with which the disease is progressing; for in cases where the destructive process is rapid the bacilli are numerous and are arranged in groups and masses. This rule, however, is not invariable. In cases of rapid phthisis I have known the bacilli in the expectorated muco-pus to be very few in number.

Pulmonary phthisis often lasts much longer than would be expected from the character of the physical signs. A child may continue in the same state, without much improvement, or aggravation of his symptoms, for years. It becomes, then, a question of much importance to decide in any given case upon the prospects of a lengthened course, and such decision will depend in a great measure upon the presence or absence of grey tubercle. Uncomplicated pneumonic phthisis is often very sluggish in its progress; and if not extensive at first may spread over the lung very slowly. It is, however, always liable to take on suddenly a more rapid course, and too great confidence should not be excited by the apparent inactivity of the disease.

Fibroid induration is a still slower disease. In such cases the prognosis, so far as that can be founded upon the anatomical character of the phthisis, is of all the varieties the least unfavourable.

In the case of grey tubercle, either alone or complicating the other varieties of pulmonary phthisis, very little hope can be given. The most favourable change appears to be its complication with cirrhosis; by this means life is often prolonged for a considerable time. The presence of secondary deposits in other organs, especially the bowels, is very unfavourable. Diarrhœa is not unfrequently the direct cause of death.

Death may take place suddenly, without being preceded by any great aggravation of the other symptoms. Usually, however, it is ushered in by greater severity of the cough, sensation of oppression about the chest, lividity of the face, increased weakness, and all the signs of exhaustion. Pneumothorax is very rare in children. When a secondary tuberculosis comes on, death is often preceded by the symptoms of the third stage of tubercular meningitis.

Causes.—Although pulmonary phthisis may occur in children not naturally predisposed to chest affections, it is usually the consequence of well-marked constitutional tendencies, which regulate the form the disease is to assume. These tendencies, as has been before explained (see page 256), are generally indicated by some peculiarity of shape or build. One child may show a leaning to true tubercular formation; another to the rapid proliferation and caseation of cellular elements. In either case there is usually a distinct family history, pointing to the special variety of pathological lesion. It does not, however, follow that parents so affected must necessarily implant the seeds of similar disease in their children. Such children may grow up without showing any signs of a diathetic tendency; the predisposition either not having been manifested in them, or, if present at first, having been effaced by the care with which the children have been reared. In all cases, probably, the actual outbreak of the disease is induced by some external exciting cause. Even children whose family can boast complete absence of consumptive history may acquire a form of pulmonary phthisis by long exposure to insanitary conditions. But where a predisposition exists, neglect of the rules of health is followed by the same result, all the more readily in proportion to the strength of the pre-existing tendency.

The exciting causes which may determine the development of the diathetic state consists of anything which interferes with the nutrition of the body, either by preventing the introduction of nutriment into the system, or by obstructing the escape of waste matters whose removal is essential to the due performance of the various functions. Such causes are impure air, insufficient or improper food, cold and damp, want of sunlight and of exercise:—a combination of these may in any case awaken the dormant tendency and excite its manifestations.

Certain diseases may be also the starting-point for the development of phthisis in subjects predisposed to some form of lung disease. Thus, pneumonia may excite the formation of tubercle in the lung. No doubt many of the cases described as "tubercle" occurring as a result of pulmonary inflammation, have been cases of cheesy pneumonia, the so-called "tubercle" being merely the yellow infiltrated deposit which is so often left in that disease; but this pneumonic condition may itself induce the formation of true grey granulations in the tissue around it.

Measles and whooping-cough are often exciting causes of phthisis, and may set up the disease in two forms. They may lead to the development of grey tubercle, or may excite a catarrhal pneumonia, which runs a slow course and leaves an unabsorbed deposit behind it in the lung. Even when it does not follow an acute disease, catarrhal pneumonia occurring in an unhealthy child, or in one who inherits a pulmonary weakness, is seldom completely recovered from. On this account pneumonic phthisis is by far the most common variety of consumptive disease, and is found comparatively often in children in whom no inherited tendency can be discovered. Chronic tubercular phthisis, on the contrary, seldom occurs in children who are not born with a strong predisposition to this form of consumption. Its outbreak can be usually traced to some causes which have reduced the general strength and impaired the nutrition of the patient. It may be also the consequence of infection of the system by cheesy glands or carious bone; but this is more commonly followed by an acute than a chronic formation of tubercle.

Infection of the system by decaying animal matter may also set up a form of pneumonic phthisis. Sir Andrew Clark showed, in 1866, that certain dead animal products inserted beneath the skin of a rabbit produced deposits, first in the lungs, and afterwards in other parts of the body. If the animal was healthy these became absorbed; but if he was unhealthy, or, being healthy, was kept in conditions unfavourable to health, the deposits were not absorbed, but excited secondary deposits in other parts. The same thing may occur in the human subject. Portions of septic matter, from whatever source, retained in contact with a living surface, may become absorbed and give rise to "secondary deposits in the lungs, to ulceration in the bowels, to clottings in vessels, and to poisoning of the blood."

The discovery of the bacillus has directed attention anew to the origin of phthisis by infection; and the question of the communicability of the disease from person to person has again been under discussion. Bacilli have been discovered in the air expired by consumptive persons; so that if this organism were really a medium of infection evidence of the transmission of phthisis by this means would not be difficult to obtain. No such evidence, however, is forthcoming: indeed, all clinical experience is adverse to the assumption that pulmonary phthisis can be communicated by this means.

Fibroid induration is, in the majority of cases, a consequence of catarrhal pneumonia, especially of the sub-acute form, such as occurs after measles or whooping-cough. It may be also excited by pleurisy. Sir Andrew Clark has described a form of basic lung disease which results from this cause, the induration extending inwards from the pleura. When once set up, the disease extends itself by repeated attacks of acute or sub-acute catarrhal pneumonia, excited by exposure, or by lung irritation from retained and putrefying secretions in the tubes. The same cause may produce extensive ulceration and destruction of lung, starting from the bronchi (fibroid phthisis).

Prevention.—If the mother be consumptive, she should on no account be allowed to suckle her child longer than the end of the first month; a healthy wet-nurse should then be provided to take her place. So much has been said in the present volume as to the feeding and general management of young children that it will be unnecessary to repeat in this place the various rules for the diet, clothing, &c., of infants, which have been already laid down. The reader is referred to the chapter containing the treatment of simple atrophy, and to that on the prevention of diarrhœa, for full information upon these points.

The diet of an older child should be so arranged that he may take as much as he can readily digest, but no more. Animal food should be given to him only once in the day, and should be either roasted or boiled; meat cooked a second time, as hashes, or stews, or meat fried in grease, are less digestible, and should not be allowed. After the age of two years a child should take four meals a day: of these two should consist of bread and milk; a third of meat, finely minced at the first, afterwards cut into small pieces, with a little potato carefully mashed, and gravy; a fourth of farinaceous pudding, or an egg lightly boiled. The milk should, if possible, be fresh from the cow; if not, a tablespoonful of cream should be added. It is important to accustom the child early to masticate his food thoroughly: this point should be always attended to. Children often wake hungry in the early morning; it is well in such cases to place, overnight, a piece of dry stale bread, or a plain biscuit, by the side of their bed, so that they may not be forced to wait without food until their breakfast is prepared.

Well-ventilated rooms, fresh air, and plenty of exercise must, of course, be insisted upon. The skin should be kept perfectly clean by cold or tepid sponging over the whole body in a bath, twice a day, and should be afterwards excited gently to act by friction with hand.

The dress should be warm but loose: tight waistbands, and, in girls, stays are exceedingly injurious. Nothing should be allowed to interfere with the free play of the chest. Pressure upon the ribs not only prevents a proper expansion of the lungs, but also is apt to cause displacement of the liver and stomach, and much derangement of the functions of digestion and respiration may be the consequence. "The only way," says Dr. Underwood, "in which we can assist in forming a really fine figure, is to remove all restraint, and secure, as far as possible, so free an action to the muscles as will lead to their perfect development. By such a course we shall best promote the acquirement of a good carriage, which is infinitely more likely to be the result of a perfect balance of the muscles, than of any mechanical support whatever."

The preceding remarks do not refer to the abdominal belt, which should always be worn until the child is, at any rate, three years old. The band covers the belly, but does not confine the ribs, if properly applied round the upper part of the pelvis.

Children, both boys and girls, should be encouraged to exercise their muscles by outdoor games, and by gymnastic exercises suited to their age and sex. While, however, plenty of fresh air and exercise out of doors are of extreme importance, unnecessary exposure of children to cold winds and damp air, with a view of "hardening the system," is a practice which cannot be too strongly condemned. The most robust children are exceedingly sensitive to changes of temperature, and in cold, damp air readily part with their heat, and become pinched and blue, showing that they are suffering from the effects of cold. Many an attack of inflammation of the lungs has been excited by such a practice, and in children already predisposed to phthisis unnecessary exposure is one of the most certain ways of encouraging the tendency. A dry, airy situation should be always recommended. Dr. Buchanan has shown that phthisis is much more prevalent amongst populations living on low-lying, impervious soils than amongst the residents of places more highly situated, and where the soil is pervious. In the selection of a house this is a matter, therefore, of much importance.

In children who suffer from caries, an operation for the removal of the diseased portion of bone should not be delayed. Tubercular disease may be set up by such a condition, and it is important to guard the child from this danger. When the bone disease is cured, the child often becomes strong and healthy. Early attention must also be paid to the local inflammations and suppurations to which scrofulous children are so liable. The child must be kept scrupulously clean, and any discharges from the ears, nose, or vagina, should be at once treated by suitable applications. For cheesy tonsils, Sir Andrew Clark advises, in addition to general tonic remedies, alkaline applications to the throat, and gargles of tannin and alum.

In cases where the shape of the chest is elongated and narrowed from before backwards, showing the small size of the lungs, every means must be taken, by exercises carefully proportioned to the strength of the patient, to increase the capacity of the chest, and invigorate the muscles of respiration. This is effected in a great measure by general exercise; but, besides this, the more special exercises, as the use of the dumb-bells and of the "chest-expander," are particularly valuable. Drilling, fencing, and other amusements which promote the acquirement of a good carriage, accustoming the child to throw back the shoulders and expand the lungs, are also of much service. By such means the capacity of the chest may be very much increased, and greater freedom be given to the play of the lungs.

Treatment.—In the treatment of pulmonary phthisis, three things are indispensable. A free supply of fresh air, avoiding chills; a moderate amount of exercise, avoiding over-fatigue; and plenty of nourishing food, avoiding repletion and indigestion. The child should pass as much time as possible out of doors during the day, returning, however, to the house before sunset; as the temperature often falls considerably at that time, and rapid changes of temperature are to be avoided. Cold is not so injurious as damp. These patients, if warmly clothed, often bear well and are benefited by cold air. Damp, however—at any rate the moist air of low-lying inland situations—is extremely prejudicial, and while the ground is wet, the children should be kept indoors, or should only be exercised with very great caution. The moist air of the seaside does not appear to be so injurious, and many cases of pulmonary phthisis are greatly benefited by a residence near the sea. For the winter months, and in cases where a change of air is advisable, it often becomes a question of considerable difficulty to decide upon the best climate to which the patient can be sent. In the early stage, before softening has begun in the lung, it may be laid down as a rule, that the best climate is one where the temperature is as low as can be borne. A warm climate, unless in exceptional cases, has no special advantage, and heat combined with moisture, as in Ceylon and Madeira, is as a rule positively injurious. A hot, moist climate is only of value in cases where there is excessive irritability of the bronchial mucous membrane, a condition which would be increased by warm dry air. In the earlier stages of tuberculosis this is, however, seldom a prominent symptom. The object of a change of residence in this disease is to obtain a climate where the patient can pass his time out of doors without incurring the risk of catarrh, and where, at the same time, the quality of the air is sufficiently invigorating. When the climate is damp as well as warm, the relaxing qualities imparted by the moisture usually cause so much depression, destroying the appetite and increasing the languor, as to counteract the benefit afforded by the more genial air. In determining this question regard should always be paid to individual peculiarities. Some children will require a much greater degree of warmth than others, and it will be necessary to take into consideration the influence which differences in temperature have already appeared to exercise upon the health of the patient—whether he has seemed to be more benefited by heat or by cold—before deciding in any case upon the exact climate which offers the best chance of recovery. For the special advantages afforded by different localities the reader is referred to the many excellent works upon this subject which have been published. It may be remarked, however, that dryness of soil and protection from north and east winds, during the winter and early spring, are always essential. The other conditions to be desired must be determined by the requirements of the particular case.

In the later stages of the disease, when softening of the consolidating matter has taken place, and cavities have formed, a warmer climate is desirable ; but even in these cases there are great differences in different patients, and some will require a much less degree of heat than others. Unless there be great irritability of the bronchial mucous membrane, dryness of the air is of extreme importance, as a dry air, although warm, still possesses bracing properties. If the lungs are very irritable, a certain amount of moisture is of service ; and many places, both in England and abroad, are recommended for such cases. If, however, a suitable climate can be found in their own country, it is well not to send these patients too far from home. Invalids feel acutely the absence of home comforts, and in the last stage of the disease especially, when little good can be hoped for from travel, it is cruel to send them away merely to die.

Moderate exercise while out of doors should always be enjoined, due regard being had to the degree of vigour of the patient. This is of great importance, for, unless the weather be warm, a proper action of the muscles is required to stimulate the circulation and prevent the body being affected by the cold. Over-fatigue must, however, be carefully avoided; and if there be any feeling of cold after a short stay in the open air, it will be necessary to return at once to the house. If the child be strong enough, pony or donkey exercise may be recommended. In cases, however, where the exertion required for riding is too severe, an open carriage can be substituted; and the child can occasionally take a short walk, returning to the carriage when fatigued. Care must be taken that the child is perfectly warm before he leaves the house. If he is chilly when he starts for his airing, his power of resisting external cold is very much impaired. Different exercises should be devised by which the muscles of the arms, chest, and back may be brought into action; and, where the strength permits, quiet outdoor games should be encouraged. Shampooing must not be forgotten; by this means the development of the muscles is aided and the action of the skin promoted. It should be practised every morning after the bath.

Indoors, free ventilation must be sustained, while every care is taken to avoid draughts. In winter, it is important that the rooms be kept at an even temperature, and that the passages, if possible, be warmed. If this is impracticable, some extra clothing should be put on in bad cases before the child is allowed to pass from one room to another.

The action of the skin must be promoted by warm clothing, and by daily sponging with tepid water. In every case of lung consolidation cold baths must be forbidden. The shock produced by the first contact with cold water at once drives the blood from the surface to the interior, and causes a sudden increase of the strain upon the vessels of the lungs, as well as of the other viscera. Pulmonary congestion may be produced by this means, and the danger of hæmoptysis is increased.

The diet of the child should be arranged as described under the head of prevention; four small meals being preferable to three larger ones in the day. Plenty of new milk is essential, and should always be given undiluted if it can be borne. Sometimes, however, in these cases there is a tendency to acidity of the stomach. This can be corrected by the addition of lime-water, or of fifteen or twenty drops of the saccharated solution of lime to the milk. On account of the debility of the digestive organs, which is so common in this disease, it is necessary to exercise great care in the selection of the diet. The simplest articles of food are the best, as plain roast beef or mutton, with gravy, mealy potatoes well mashed, milk, and strong beef or mutton tea, free from grease. Clear turtle soup is exceedingly digestible and nutritious. If eggs are allowed they should be lightly boiled or poached, or they may be beaten up with warm milk. Farinaceous food should enter into the diet, but, on account of its tendency to undergo fermentation and produce acid, its effects must be carefully watched, and no more should be given than can with safety be digested. Often, however, the appetite is very capricious, and there is a disgust for meat and for the plainer articles of food, which it is very difficult to overcome. In such cases frequent changes should be made in the diet, tempting the appetite with a small bird, as a quail or a snipe; with fish, as turbot, cod, or boiled sole, or with raw oysters. The addition of alcohol is often useful in stimulating the appetite: weak claret and water, or a large wineglassful of light bitter ale, may be given to a child of six or seven years old, with one of his meals. The occasional administration of two or three grains of hydrargyrum cum cretâ with a little powdered rhubarb will often improve the appetite when this is failing; or a drop or two of dilute hydrocyanic acid with ten grains of bicarbonate of soda may be given in a bitter infusion, as infus. chirettæ, three times in the day.* The mineral acids in bitter infusion are also of service, but in the case of a child they are, as a rule, inferior in value to the alkaline medicines just mentioned.

A careful watch must be kept over the condition of the bowels, for our hopes of improving the nutrition of the body depend entirely upon the accuracy of the performance of the digestive functions. Violent purgatives should be avoided. If there is constipation, an occasional dose of castor oil, or decoction of aloes, will be sufficient to produce an evacuation. The more common condition, however, is one in which there is a tendency to relaxation of the bowels, three or four light-coloured offensive motions being passed in the course of the day. In these cases opium is a most valuable medicine, and should be given with aromatic sulphuric acid if the tongue is clean; or, if there is much straining, with mucus in the stools and a furred tongue, it can be given with small doses of castor oil.

When the digestive organs have been brought in a healthy state, cod's liver oil and tonics become necessary to continue the improvement. These are as beneficial now as they were injurious so long as there remained any functional derangement of the alimentary canal. Cod's liver oil is of immense service, but care must be taken to proportion the quantity given to the digestive power of the patient. At first half a teaspoonful is a sufficient dose; it should be taken three times a day after meals in a little milk, orange wine and water, or, better still, in a cold infusion of orange-peel. The dose can be afterwards increased, but the stools should be examined from time to time for undigested oil. When the common oil does not agree, Kerr's unbleached oil may be tried; or the remedy may be administered in a teaspoonful of the pancreatine wine prepared by Messrs. Savory and Moore. This preparation is a valuable one for children who have only a limited power of digesting fats.

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* Suitable to a child five years old.

Sugar is strongly recommended by Dr. Fuller as a substitute for cod's liver oil, and may be taken by children in the agreeable form of sugar-candy or barley-sugar, *after meals.* If, however, it deranges the stomach and causes acidity, its use must be abandoned.

Under the head of tonics, iron takes the first place. It may be given as vinum ferri; liquor ferri pernitratis with dilute nitric acid; the ammonio-citrate; the potassio-tartrate; reduced iron (in doses of half a grain twice a day); or the syrups of the phosphate or iodide. If the syrup be objected to, the iodide may be conveniently given as in the following mixture:—

℞. Ferri tartarati, gr. v;
Potass. iodidi, gr. jss;
Aquæ destillatæ, ℥ss. M. Ft. haustus.
To be taken three times a day.

Iron has been objected to, as tending to produce irritation and congestion of the lungs and hæmoptysis. If, however, it is not given in too large does, such effects in children are seldom seen to follow its employment. On the contrary, where the condition of the stomach and bowels is satisfactory, its use is generally followed with very great, if only temporary, advantage.

Besides iron, other tonics may be given; as quinine, which may be usefully combined with iron, as in the double citrate of iron and quinine (dose, five grains three times a day suspended in glycerine); decoction of cinchona; tannic acid, either in a mixture with dilute nitric acid, or as the decoction of oak-bark; and the tincture of nux vomica. All these may be tried, and sometimes one, sometimes another, will appear to be beneficial.

With regard to the special treatment of the lung affection :—so long as there is fever, with dry cough or scanty expectoration, and tightness or oppression of the chest, stimulant expectorants are inadmissible. No lowering measures should be employed, it is true; but while, on the one hand, we should avoid all means calculated to increase the depression of strength, we should not, on the other hand, be too eager to administer drugs the action of which would be to increase the irritation of a mucous membrane already in a state of active congestion. Opium, although it allays for a time the irritability of the bronchial tubes, is also unsuitable, for it diminishes expectoration; and the secretions would therefore remain in the tubes to be a source of continued irritation. In such cases we shall best relieve the engorged state of the lung by the administration of remedies tending to produce a copious secretion from the congested mucous membrane. The child should be confined to bed, or at any rate to one room; his chest should be kept covered with hot linseed-meal poultices, frequently renewed; and a mixture such as the following should be administered every three hours :—

℞. Vini antimonialis, ♏x ;
Vini ipecacuanhæ, ♏iij ;
Sp. ætheris nitrosi, ♏xv ;
Liq. ammoniæ acetatis, ʒss ;
Aq. carui ad ʒiij. M. Ft. haustus.

After the cough has become looser, and the oppression of the chest has subsided, expectorants, with small doses of morphia, may be given three times a day :—

℞. Sp. ammoniæ aromat. ♏v ;
Vin. ipecacuanhæ, ♏x ;
Liq. morphiæ, ♏iij ;
Syrupi limonis, ʒss ;
Aq. ad ʒiij. M. Ft. haustus.

And afterwards, when the secretion is free, and the fever has subsided, an astringent may be prescribed:—

℞. Liq. ferri pernitratis;
Acidi nitrici diluti, āā, ♏v;
Liq. morphiæ, ♏iij;
Oxymel scillæ, ♏xxv;
Aq. ad ℥iii. M. Ft. haustus.
To be taken three times in a day.

On account of the derangement of the stomach, which is so apt to be produced by even small doses of the nauseating expectorants, such as ipecacuanha and squill, it is advisable to combine them with tonics when the state of the patient permits. In this way they are better borne by the stomach, and cause less impairment of the appetite. The alkaline mixture should not be continued too long: when the secretion is quite free, as shown by the looseness of the cough, the ease of expectoration, and the absence of fever, astringents are required to dry up the secretion, and give tone to the relaxed mucous membrane.

Antiseptic inhalations have lately come much into favour. The air of the room at night may be impregnated with the fumes of tar, creasote, or carbolic acid, by means of a vaporizing apparatus, such as Dr. R. J. Lee's useful "Steam Draught Inhaler." In the daytime various antiseptics may be inhaled for an hour at a time through a perforated metal respirator. Dr. Coghill, who has devised a convenient form of instrument, combines two drachms each of etherial tincture of iodine and carbolic acid, with one drachm of creasote, and one of rectified spirit. Ten drops of this preparation are poured upon a piece of cotton wool and used in the respirator. The inhalation may be repeated several times in the day. Its effect is to diminish the violence of the cough and render expectoration easier.

In cases where we have reason to believe the consolidation to be owing to cheesy pneumonic deposits, we must do all in our power to hasten the absorption of the caseous mass. Removal to a dry bracing spot is at once indicated, and as soon as possible the child should begin a course of alkaline medicines. Sir Andrew Clark recommends that the urine be kept alkaline for a time. The hypophosphites —especially the hypophosphite of lime—are of peculiar value in these cases. When softening of the deposit is suspected, and there is fever with wasting, the beneficial influence of these remedies is often very surprising.

Counter-irritation in children must be used cautiously. So long as there is fever, with dry cough, &c., hot linseed-meal poultices are the best applications; and these, combined with the measures described above, soon relieve the more acute symptoms. Irritants applied to the chest appear to be most useful when the consolidation is pneumonic in character. In such cases a liniment of croton oil (ʒj in ℥j of linimentum saponis) may be rubbed into a limited spot twice a day till pustulation, and then once a day for a week; or the chest may be painted over the seat of disease with linimentum iodi. These measures are, however, only applicable when the pyrexia is slight; if there be much heat of skin counter-irritants must not be employed.

In the last stage of the disease we must watch the state of the digestive organs, and endeavour to remove any conditions which would tend to increase the debility. If the cough produces retching and sickness, small doses of arsenic, such as one drop of Fowler's solution, given with dilute nitric acid and a few minims of liquor morphiæ will usually afford relief. If hæmoptysis occur, the child must be kept perfectly quiet in bed; ten drops of the liquid extract of ergot should be administered three times a day, with laxative doses of Epsom salts if the bowels are not ulcerated, and fluids must only be given in small quantities. Profuse sweating is best controlled by belladonna given in sufficient doses. A night draught containing thirty drops of the tincture may be given without hesitation to a child of four years old, and will have greater influence than smaller doses of the drug given more frequently.

In cirrhosis of the lung and fibroid phthisis disinfectant and stimulating inhalations are of great service. Whenever an offensive smell from the breath indicates the presence of putrefying secretions in the air-tubes, inhalations of steam impregnated with creasote or carbolic acid (twenty drops to the pint of boiling water) should be ordered; and the air of the room should be thoroughly saturated with the fumes of creasote or other disinfectant by means of a vaporizer. Iron and quinine in large doses are well borne in these cases, and should be given with morphia. Emetics must not be forgotten. A quickly-acting emetic, by producing violent contractions of the diaphragm, will often cause enormous quantities of offensive purulent matter to be brought up. If the loaded tubes are thus evacuated in the morning, the patient will pass the day in much greater comfort, and his appetite and digestion will be improved. Cod's liver oil—especially if given with pancreatine wine—is of much value in these cases. When dropsy comes on, tonics, such as strychnia and iron, should be administered at once.

CHAPTER X.

CASEATION OF LYMPHATIC GLANDS.

Of Glands in General.—Acute inflammation of a gland—Suppuration—Chronic inflammation—Caseation, or cheesy degeneration—Characters of cheesy glands—Modes of termination—Softening—Petrifaction—Absorption—Fibroid thickening—Dangers of softening cheesy matter.

Of Bronchial Glands.—Seat.—*Symptoms.*—Produced by pressure upon neighbouring organs—On veins—On nerves.

Physical Signs.—Alterations in respiratory sounds produced by pressure on trachea and bronchi—Modes of termination.

Diagnosis.—Value of venous hum in early diagnosis of this lesion—Illustrative cases.

Prognosis.—Value of the thermometer.

Of Mesenteric Glands.—*Symptoms.*—General—Local—Pressure on vein—Ascites usually the result of peritonitis—Shrinking and petrifaction of glands—Perforation of bowel.

Diagnosis.—Only to be made by feeling the glands—Diagnosis from fæcal accumulations—From cheesy masses attached to the omentum.

Prognosis. Treatment.—Preventive—General—Diet—Change of air—Cold bathing—Special—External applications—Of abscess—Internal remedies—Treatment of bronchial glands—Fresh air—Cod's liver oil—Iodide of iron—Local application of iodine—Treatment of mesenteric glands—And of complications.

CHRONIC enlargement of the lymphatic glands is a common lesion in the child. It may affect not only the external glands, but also those occupying the thoracic and abdominal cavities. While, however, in the case of the external glands, no other ill effects follow than those due to impairment of function in the glands themselves, in the case of the bronchial and mesenteric glands other evils are induced. These bodies—enclosed as they are in cavities, and in contact with compressible organs—produce by their pressure, when enlarged, secondary disturbances which vary according to the organ whose function is thus interfered with, and according to the more or less yielding material of which the walls of the cavity are composed. Enlargement of the bronchial glands will thus produce more serious consequences—owing to the resisting parieties of the chest—than the same condition of the mesenteric glands which are confined by the more distensible wall of the belly.

In children lymphatic glands are very liable to become enlarged from neighbouring irritation or inflammation, some irritating matters being conveyed into them by the lymphatics coming from the inflamed part. This is well seen in the case of impetigo of the head and face, when the glands of the neck or those beneath the chin—according to the seat of the eruption—speedily become enlarged and tender to the touch. The swelling of the gland is the consequence of increased vascularity, and a multiplication of its corpuscular elements. There is probably a direct migration of leucocytes from the hyperæmic vessels, but the accumulation of lymph cells is no doubt principally due to a proliferation of the existing cells of the gland. These multiply rapidly, swell up, and acquire many nuclei which fill their anterior.

If the irritation persist, and the rapid production and accumulation of lymph corpuscles go on unchecked, the reticulum becomes ruptured and destroyed. With it disappears the capillary network; nutrition in the part is arrested, and there is rapid disintegration and suppuration of the contents of the gland. If, however, the neighbouring irritation can be allayed and the excessive production of cells checked before the accumulation of corpuscles has interfered with the nutrition of the gland, a fatty degeneration takes place in the new elements which through its influence secondarily upon the system, owing to pathological changes occurring in it.

When a caseous gland softens, the process usually begins in the centre, although isolated points at the circumference may first undergo this change. These, on section of the gland, are sometimes seen to be connected by prolongations of softening with the softened centre. Evacuation of the liquefied matter may eventually take place, and it is common enough for superficial glands to discharge their contents through the skin. In the case of deeply-seated glands this mode of termination is less frequently met with.

Softening of a cheesy gland, wherever situated, can never be viewed with indifference. The presence of softened cheesy matter in any part of the body is sometimes a cause of general infection of the system, so that the patient falls a victim to secondary acute tuberculosis. The occurrence of general tuberculosis after measles and whooping-cough may, no doubt, be frequently attributed to caseous softening of a bronchial gland.

In all cases of glandular swelling the lesion has probably been preceded by irritation in the part in which the lymphatics which pass through the gland have taken their origin. Such irritation, however, need not be severe or persistent. In the case of a scrofulous child, where the lymphatic system is particularly sensitive, a very slight and passing irritant may set up this action in a gland; and the enlargement seldom subsides with the removal of the cause which has excited it. If the increase in size persist for a long time without any tendency to diminish, we have reason to consider that the gland has become caseous.

Caseation of the Bronchial Glands.

Judging from the facility with which the superficial glands swell up in the child, as a result of casual irritation of neighbouring parts, we may infer that a similar enlargement will occur under like circumstances in glands more deeply placed. The bronchial glands are, no doubt, influenced by the presence of irritation in parts in which their lymphatics originate: and in children who have been subject to repeated attacks of pulmonary catarrh, or to chronic forms of lung disease, evidence of change in these glands is seldom wanting. Unlike the same lesion as it occurs in the neck, suppuration is rare as a result of the irritation, but few pathological alterations are more common in the post-mortem room than enlargement and caseation of glands in the mediastinum.

The seat of the enlarged gland is at the bifurcation of the trachea, and therefore behind the first bone of the sternum and a little below it. Besides these, however, the glands accompanying the bronchial tubes into the interior of the lung may be also increased in size, although usually to a less extent; and it is not uncommon to find them larger than natural as far as the third or fourth divisions of the air-tubes. A mass formed of these enlarged glands may occupy the anterior mediastinum, extending from the top of the sternum to the base of the heart.

Caseation of the bronchial glands is not confined to consumptive children, *i.e.*, to children in whom there is actual disease of lung. It may be present in subjects where there is no reason to suspect the presence of any pulmonary complaint, and where, indeed, the most careful examination of the lungs may detect no evidence of mischief. Still the presence of a cheesy mass is not unattended with risk; and its very existence is a sign of that vulnerability of constitution which predisposes to the so-called consumptive diseases, and is a constant source of danger.

Symptoms.—Children in whom this lesion exists are usually thin and pale. They are also generally languid and indolent, preferring quiet amusements to the more boisterous games. Nutrition is impaired as a consequence of the various catarrhal disorders to which their exceptional sensitiveness to changes of temperature renders them peculiarly liable. Attacks of pulmonary and gastric catarrh, and of catarrhal diarrhœa, are frequent during the changeable seasons of the year; and the tendency of a pulmonary catarrh in such subjects to become chronic and induce pathological changes in the lungs, explains the frequent co-existence of chronic lung disease with caseous glands in the mediastinum. The digestive organs, owing to the frequent catarrhs above mentioned, are not very robust; but between the attacks the child's appetite may be good, and the digestion fairly performed. A cheesy gland, so long as it remains inactive, does not directly give rise to elevation of temperature; but the child is subject to irregular attacks of fever, as a consequence of the catarrhal derangements above referred to. If softening in the cheesy mass occur, the event is at once marked by an increase in the heat of the body.

The special symptoms arising from enlargement of the bronchial glands are all pressure signs due to the encroachment of the swollen body upon the parts around. These special symptoms may best be grouped according to the causes which produce them. Thus, the glands by their enlargement may press upon the blood-vessels, the nerves, and the air-passages.

Pressure upon the superior vena cava, or upon either innominate vein, interferes with the return of blood to the heart. As a consequence, we find more or less lividity of the face and neck, and dilatation of the superficial veins, not only in those parts, but also over the front of the chest, and often in the shoulders and arms. A certain amount of heaviness and stupor may be produced by the interference with the return of blood from the brain; and if the pressure be great, or the quality of the blood much impoverished, puffiness or even œdema of the face may be found, first appearing and being most marked about the eyelids. If only one of the innominate veins is exposed to pressure, the symptoms are limited to one side only. Enlargement of the veins of one side of the face and neck, with a prominent jugular vein on that side, should always lead us to suspect the existence of enlarged bronchial glands. The venous engorgement is especially noticeable during coughing.

If the congestion is very great, rupture of small vessels may take place, and bleeding occur from the nose or into the lungs. The former is common, but the latter is difficult to ascertain, for children almost invariably swallow blood coming up from the lungs. In a child the discharge of blood from the mouth during coughing, is seldom evidence of hæmoptysis. It is almost always the result of epistaxis, the blood flowing down into the back of the throat through the posterior nares.

When the nerves passing through the chest are compressed, one of the earliest indications of such pressure is a peculiar character of the cough. The cough becomes spasmodic, occurring irregularly in paroxysms like those of pertussis, lasting only a short time, and ending sometimes, although rarely, in a crowing inspiration. There is seldom any vomiting. Sometimes the cough is hoarse and dry; at others it is moist with a rattling of mucus; at others, again, its quality is unchanged, and presents nothing to attract attention.

The voice, like the cough, may be altered in character, but not usually, unless the disease is far advanced. It may become hoarse or thick, or even partially extinct, and these different conditions frequently alternate with one another.

Serious pressure upon the trachea or a large bronchus induces attacks of distressing dyspnœa. These attacks are usually spoken of as "asthmatic." The face becomes livid, the countenance haggard, and the skin damp. As a rule the dyspnœa affects both inspiration and expiration, although it is more marked in the latter. With each breath there is a stridor, and the soft parts of the chest sink in deeply in inspiration. Exertion of any kind increases the dyspnœa. The voice is unaffected. When these symptoms are met with, especially if at the same time there are signs of pressure upon the vessels of the chest, we have reason to fear suppuration of the glands with the formation of an abscess. If this be the case, perforation of the air-passage is not unlikely to occur. The dyspnœa is then extreme with marked cyanosis; the cough is convulsive, and the child clutches at his throat and shows every symptom of distress. The pulse and respiration become irregular before death.

Attacks of spasm of the glottis sometimes are noticed; Dr. Ley long ago pointed out that laryngismus stridulus was frequently to be attributed to this cause. If the laryngeal spasm be long continued, so as to produce a chronic impediment to the entrance of air into the lungs, the pressure of the atmosphere produces a curious deformity of the thorax, diminishing its antero-posterior diameter, and sometimes, if the cartilages are softer than natural, forcing the sternum backwards, so that the depressed bone makes a vertical groove on the front of the chest.

If pulmonary catarrh occur in a child who is suffering from the above symptoms, the lividity is deepened, the dyspnœa aggravated, the cough becomes more constant and hacking, and the apparent imminence of the danger excites the liveliest apprehensions. Indeed, if prompt measures are not resorted to for the relief of the catarrh, death may take place with some suddenness.

Physical signs.—The enlarged glands are seated at the bifurcation of the trachea, and therefore behind the first bone of the sternum. On percussion there is dulness at that spot, which may extend to a variable distance on either side, and below. It sometimes reaches from the sternal notch as far as the base of the heart. Occasionally there is dulness also between the scapulæ, but this is not always found, on account of the thickness of lung which lies between the glands and the posterior wall of the chest. If any enlarged glands lie underneath the anterior margins of the lungs, a "crack-pot" sound may be heard on percussion over the first three ribs. This, however, on account of the natural pliancy of the chest-walls in children, is a common circumstance, and is not necessarily a sign of disease.

The auscultatory signs are due partly to the effects of pressure of the enlarged glands upon the trachea and bronchi; partly to the unnatural distinctness with which the breath-sounds are conveyed to the surface, for an artificial medium of conduction is formed between the tubes and the wall of the chest.

When the lower part of the trachea is pressed upon, a loud stridor is heard during respiration. This stridor is usually intermittent. It is conducted to all parts of the chest, and to the stethoscope quite covers the normal breath-sound. Upon either bronchus pressure, if considerable, causes weakness of the respiratory sound in the corresponding lung, especially at the base; for a certain amount of collapse of the inferior lobes of the lung may take place, with sinking in of the lower part of the thoracic wall on that side.

If without actual pressure the glands come into close contact with the bronchi on one side, and the chest-wall on the other, the breath-sounds are tubular with long ringing rhonchus in front, and sometimes between the scapulæ behind; powerful quasi-pectoriloquous bronchophony may also be produced. The vocal resonance also is bronchophonic.

At the supra-spinous fossæ the sounds may be weak, bronchial, or even cavernous, and these different conditions may alternate irregularly with one another. If, however, there be no disease of the lung, the hollow quality of the breath-sound is very much diminished, or may even be quite lost when the mouth is open.

If the gland presses upon a large vein, such as the descending vena cava, or the left innominate vein, a hum will be heard with the stethoscope at that point, and compression of the pulmonary artery produces a systolic murmur, heard at the second left interspace.

In cases where the glandular swelling occurs as a complication of pulmonary phthisis, the more prominent symptoms are due to the condition of the lung; so that unless the enlargement be great, the disease in the glands is apt to be overlooked. Moreover, in such cases the physical signs arising from the lungs are often perverted and exaggerated by this condition of the glands, as has already been described.

The usual termination of enlarged bronchial glands is that by shrinking and petrifaction—a mode of termination which may be considered equivalent to a cure. In rare cases they soften and break down into a thick purulent fluid, which may be evacuated into the pleural cavity, or into a large vessel, causing fatal hæmorrhage; or, more commonly, into a bronchial tube. Sometimes the softening glands give rise to a general infection of the system, and the patient dies of acute tuberculosis. In other cases pneumonic phthisis is set up, ending speedily in death.

Pneumonic phthisis is frequently complicated with enlarged and caseous bronchial glands, for any pulmonary irritation is apt to lead to swelling of these glands, and, in certain subjects, to their caseous degeneration. In most cases the glandular disease is secondary to the condition of the lung, and softening of the degenerated glands may occur simultaneously with breaking up of the cheesy matter in the lung. Therefore when death results from pulmonary consumption, in cases where the bronchial glands are large and cheesy, the condition of the glands, although an item to be considered in the prognosis, has not necessarily any influence in bringing about the fatal termination.

Diagnosis.—In a well-marked case the signs of pressure upon the veins, the dulness over the first bone of the sternum, extending to a variable distance on each side, and the paroxysmal cough, point conclusively to caseation of the bronchial glands. The peculiarity of the cough is, indeed, often the first symptom leading us to suspect the nature of the disease. This is distinguished from the cough of pertussis, which it so much resembles, by the absence of crowing and of the terminal vomiting or glairy expectoration. Such a cough, if unaccompanied by the auscultatory signs of pulmonary disease, is very distinctive of enlarged bronchial glands. The absence of these auscultatory signs is very important in the diagnosis, as a morning cough of a very similar character is occasionally heard in cases of fibroid induration with dilatation of bronchi, and is sometimes also characteristic of catarrhal pneumonia. If, in the intervals of the fits of coughing there is anything approaching to an asthmatic seizure, or the slightest percussion-dulness at the top of the sternum, little doubt can remain as to the nature of the disease. Alteration in the quality of the voice often accompanies the characteristic cough. If there is doubt in any case, the occurrence of signs of venous pressure at once changes our suspicions into certainty.

Well-marked pressure signs are not, however, present until the swelling of the glands has become considerable. At an earlier period, and before the enlargement has become sufficiently great to cause symptoms so obvious, the diagnosis of the lesion is far from easy, as the symptoms by which it is accompanied are few and obscure. At this time much assistance can be gained from the following experiment.* If the child be made to bend back the head, so that his face becomes almost horizontal, and the eyes look straight upwards at the ceiling above him, a venous hum, varying in intensity according to the size and position of the diseased glands, is heard with the stethoscope placed upon the upper bone of the sternum. As the chin is now slowly depressed, the hum becomes less loudly audible, and ceases shortly before the head reaches its ordinary position. The explanation of this phenomenon appears to be that the bending back of the head tilts forward the lower end of the trachea, which carries with it the glands lying in its bifurcation, and the left innominate vein, as it passes behind the first bone of the sternum, is compressed between the enlarged glands and the bone. In cases where this sign has been noticed there has often been some slight dulness over the manubrium, leading one to suspect the existence of enlargement of the glands; and the occurrence of the hum thus produced the writer always considers to be evidence confirmatory of the suspicion.

The experiment does not succeed in cases of flat chest when there is no reason to suspect glandular enlargement, nor can the hum be produced by the thymus gland in a healthy child. This gland is immediately behind the sternum in front of the great vessels; enlarged bronchial glands lie behind the vessels in the bifurcation of the trachea. A swelling in front of the vessels does not appear to set up pressure upon the vein when the head is bent back in the position described. The writer has examined many children with a view to test this point, and in no case has the characteristic hum been produced except where there was reason from other symptoms to suspect the presence of bronchial glandular enlargement.

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* See a paper by the writer "On the Early Diagnosis of Enlarged Bronchial Glands," communicated to the *Lancet*, of August 14th, 1875.

The following cases furnish good illustrations of the symptom in question :—

Arthur P—, aged eight years, had had scrofulous disease of the knee-joint for twelve months. The cervical glands were enlarged, and his skin generally was harsh and dry. For two months his breathing had been short, although he had had no spasmodic attacks of dyspnœa. During the same time he had been troubled with a dry hollow cough. There was slight dulness at the left supraspinous fossa, and a little crepitating rhonchus was heard there at the end of inspiration. There was no dulness on percussion at the upper part of the breastbone ; but when the boy held his head back so as turn his face upwards to the ceiling, a loud continuous hum was heard near the left edge of the first bone of the sternum. This ceased when the chin was brought down again into the natural position. The boy had no swelling of the cervical veins, spasmodic cough, or other sign of enlarged bronchial glands, except the peculiar and characteristic hollow, almost cavernous, breathing which is often heard in such cases, when the lips are closed, over the upper part of each lung. This, however, disappeared to a great extent when the mouth was open.

Alice T—, aged six years, a pale, thin child, had been weakly for several months, and had been getting thinner. She had no cough to speak of. On stripping the child to examine her chest, it was noticed that the superficial veins at the upper part of the breastbone and at either side were unusually visible. The veins of the neck were not distended, nor was there any enlargement of the cervical glands. The percussion note on the first bone of the sternum was, perhaps, a little high-pitched. When the child bent her head well backwards, a very loud continuous roaring sound was heard over the first two sternal bones and extended to the articulation of the second right costal cartilage. The sound ceased when the chin was depressed again. There was no dulness in the interscapular region behind.

It would be easy to multiply illustrations of this symptom, for slight enlargement of the bronchial glands is very common in children. In order that the hum be capable of being produced in the vein, the glands of the chest must be movable. If they are fixed, and at some distance from the sternum, the experiment fails. Thus, in a boy aged three years, the subject of lymphadenoma, who died in the East London Children's Hospital, there was dulness at the upper part of the breastbone, which was continued down in a pyramidal form as far as the base of the heart. No venous hum was heard on bending back the head. On examination of the body of this child, yellow flattened cheesy masses were found adherent to the inside of the sternum, and others, much enlarged and immovable, were seen filling up the interval below the bifurcation of the trachea. In this case the alteration in the position of the head did not set up pressure upon the vein, as the glands, being fixed, could not be carried forward against the vessel.

The venous hum thus produced by bending back the head seems to be the earliest sign of enlargement of the bronchial glands, preceding dulness on percussion, and occurring long before the ordinary pressure signs on which the diagnosis of the lesion is usually made to depend.

Prognosis.—Although the existence in the mediastinum of swollen bronchial glands is not without its danger, yet if the increase in size be moderate, without formidable pressure signs, and especially if the temperature of the body be natural, we have reason to hope that by suitable treatment the enlargement may be reduced before it has occasioned any ill consequences to the patient. The existence of lividity, dilatation of veins, and other signs of interference with the circulation, should excite anxiety; and attacks of asthma, or of prolonged spasm of the glottis, are of very unfavourable augury. If in such cases the symptoms are aggravated by the presence of pulmonary catarrh the life of the patient is often placed in imminent danger.

It should not be forgotten that acute tuberculosis may be the consequence of softening in these glands; therefore the temperature of the body should be always carefully taken, and any abnormal rise, without a cause being discovered to account for it, should be viewed with considerable apprehension.

Caseation of Mesenteric Glands.

Caseous enlargement of the mesenteric glands, or, as it is often called, *tabes mesenterica*, is seldom seen in children under three years of age, and even in older children is not a common disease. At any rate it is comparatively rare to find enlargement of these glands so great as to be discoverable by the touch; and unless they can be *felt* it is impossible to say with anything approaching to certainty that they are enlarged at all. Unless enlarged, their influence upon general nutrition is probably insignificant; for although they may not be quite healthy, they are no doubt sufficiently so to carry on their functions fairly well. Therefore if no increase in size can be discovered, they may be disregarded in estimating the prognosis, or determining the treatment of the patient.

When diseased the glands are sometimes separate, but often they unite to form an irregular nodular mass as large as the fist, or even larger. The mass is situated in front of the vertebral column. If the mesentery is involved, the tumour is fixed; if the mesentery is free, the mass can be moved a little to one side or the other.

Symptoms.—In cases where the disease is moderate in amount, and is confined entirely to the glands of the mesentery without being complicated by any chronic lesion of the bowels, nutrition may be little if at all affected. The child may show a fair amount of flesh; his spirits and appetite may be good, his temperature natural, and, with the exception perhaps of slight want of colour, there may be little in his appearance to suggest a suspicion of ill-health. If, however, as often happens, cheesy enlargement of the mesenteric glands is complicated by ulceration of the bowels, there is generally diarrhœa, and the child shows all the signs of a chronic interference with the nutritive processes. He wastes, and grows pale and feeble; his face looks haggard; his sleep is disturbed; his appetite is capricious, and there is often much thirst. At night the bodily temperature is usually higher than natural.

The *local* symptoms are the only ones of any value in the detection of disease in the mesenteric glands. The belly is at first unchanged in shape, and even as the disease advances does not necessarily become more prominent. On the contrary, the abdominal wall is often natural; and when swollen it may be soft and easily depressed; although it is apt to become tense at times from the accumulation of flatus, especially if there is any accompanying ulceration of the bowels. The wall may also be tense when the size of the glands is very considerably increased. The degree of tension of the parietes is very important as regards the detection of the enlargement. If the tension be very great, a moderate amount of enlargement may escape notice, owing to the resistance of the abdominal walls, which will not allow the glands to be reached by the finger; and a tumour which can be easily felt at one visit may at the next be completely concealed by the abdominal inflation, so as to be no longer detectable by the touch.

The situation of the tumour is about the umbilicus. The swelling is irregular to the touch, and hard. Its size varies, but it may be as large as a fœtal head. When the mass is large it can be readily discovered by pressing the abdominal wall inwards towards the spinal column. When small, however, it may sometimes elude this method of palpation; while, if pressure be made laterally, bringing the two hands from the sides towards the centre, the tumour can be readily seized between the fingers. By this means a swelling the size of a nut can be felt, if the wall is flaccid. The glands are sometimes slightly movable, if the enlargement is not sufficiently great to involve the mesentery in the swelling.

There is usually more or less tenderness on pressure, but the tenderness is not necessarily a sign of inflammation of the diseased glands, for it is found in cases where no trace of inflammation is discoverable on a post-mortem examination.

When the glands reach a considerable size they may press upon neighbouring parts, so as to produce secondary derangements. Thus, pressure upon the nerves may cause cramps in the legs. Compression of the large venous trunks may give rise to œdema of the lower limbs, and dilatation of the abdominal veins. If this venous dilatation be very marked, the superficial veins being seen to ramify upon the abdominal wall, and to join the veins of the chest-wall, enlargement of the mesenteric glands should always be suspected, in the absence of chronic peritonitis, or disease of the liver.

Ascites is not a common result of the caseation of these glands, and is rarely produced by direct pressure, unless the portal vein be compressed by enlargement of the glands occupying the hepatic notch. Sometimes, however, we find cheesy degeneration of the mesenteric glands complicated by tubercular peritonitis — true abdominal tuberculosis. In these cases there is a rise of temperature, with increase of abdominal tenderness, and colicky pains. The belly becomes tense from gaseous distension of the intestines; and indistinct fluctuation is often felt from adhesion of the bowels one to another, with the addition of a little serous effusion between the coils. Vomiting is not constant, and diarrhœa, if previously present, is not interfered with. The amount of ascites is, in these cases, not very great, and the symptoms of peritonitis generally are often far from being well marked.

In ordinary cases cheesy mesenteric glands after a time diminish in size, and become small and hard by absorption of their fluid parts, and the deposition of calcareous salts. This may be considered the natural termination of tabes mesenterica. It is rare for the glands to soften, but such an exceptional result of the degeneration is occasionally seen. Adhesion may then take place between the gland and a coil of intestine, so that the softened matter is evacuated into the bowel.

Diagnosis.—The diagnosis of enlarged glands in the mesentery can only be made satisfactory by the sense of touch. If we can hold the mass between the finger and thumb, proof of its presence is indisputable, and this proof is the only one which leaves no doubt upon the mind. Enlargement of the belly is no evidence of the glandular disease, for flatulent distension is in children a common accompaniment of ill-health. Wasting, again, is found in almost all forms of chronic illness; and diarrhœa is not necessarily connected with cheesy abdominal glands. All these symptoms may be present in the case, but they are not characteristic of mesenteric disease, and we should not be justified in founding a diagnosis upon them.

If, as has been said, the superficial veins are distinctly seen to ramify on the abdominal wall, and to join similar veins on the thoracic parietes, glandular disease may be suspected; but nothing more than suspicion is allowed by such evidence. Any interference with the portal circulation will produce the same result, and when the abdominal wall is tense it is difficult to exclude hepatic disease.

Even when by direct exploration the existence of a tumour in the belly has been ascertained, we have still to satisfy ourselves that the tumour is formed by enlarged mesenteric glands. The disease may be simulated by fæcal accumulation in the colon, or by caseous masses attached to the omentum.

Fæcal accumulations are distinguished by the absence of tenderness; by the situation of the tumour, which usually occupies the transverse or descending colon instead of the umbilical region; and by the shape of the mass which is elongated, the long axis being in the direction of the long axis of the bowel in which it is contained. In doubtful cases a positive opinion should be reserved until the effect upon the swelling of a good injection has been tried. For a child of four years old, an enema of a pint or more of soap and water, or thin gruel, containing half an ounce of oil of turpentine and four ounces of olive oil, should be thrown up the bowel by a good syringe. The injection should be retained for a few minutes by firm pressure upon the anus, and then be allowed to escape. If the tumour is due to fæcal accumulation, a quantity of pale, brittle lumps will be discharged with the returning fluid, and the swelling previously noticed in the belly will be found to have disappeared. If diseased glands are the cause of the tumour, the evacuation of gas and fæcal matter will only make the presence of the enlargement more manifest, by removing the tension of the abdominal wall, and allowing of more efficient exploration of the cavity of the belly. In these cases an enema of sufficient quantity to distend the bowel is of more value than any number of aperients. It is well, also, to remember that fæcal accumulation having once occurred, there is great liability to a second collection of the same kind; therefore for some time afterwards a careful watch should be kept over the condition of the bowels.

Between cheesy masses attached to the omentum and cheesy mesenteric glands the distinction is often very difficult, particularly if the seat of the tumour happens to be the umbilical region. When their seat is the omentum the masses are more superficial, are less nodular, and have better defined edges than is the case where the glands themselves are diseased. They are usually also more freely movable.

In a case mentioned by MM. Rilliet and Barthez, a cancerous pancreas offered some resemblance to a mass of enlarged glands, but was distinguished by, amongst other signs, the presence of vomiting, jaundice, and abdominal pains.

When we have satisfied ourselves as to the existence of caseous mesenteric glands it is important to ascertain if this be the sole lesion discoverable, or if it be complicated by intestinal ulceration or other abdominal mischief. Elevation of temperature, or any indications of marked interference with nutrition, would lead us to suspect the existence of some complication. The most common of these are tubercular peritonitis and intestinal ulceration. In the case of the former we find usually swelling, pain and tenderness of the abdomen, with great tension of the parietes and unequal sense of resistance on pressure of the abdomen. Often there is an obscure sense of fluctuation. Ulceration of the bowels is shown by local tenderness of the belly with some tension of the parietes, combined with the discharge of offensive dark watery motions, containing a deposit of flaky matter, and mucus, with small black clots of blood.

Diarrhœa is not, however, present in every case of ulceration of the bowels. The loose frequent stools are not dependent upon the ulceration, but are the consequence of the catarrh of mucous membrane which commonly accompanies it. This is apt to vary greatly in intensity; and the diarrhœa may be better or worse, or may even become arrested for a time, without the breach of surface in the intestinal mucous membrane having necessarily healed. Therefore, even if there be no diarrhœa, the existence of fever with abdominal tenderness (peritonitis being of course excluded), and of some colicky pain preceding the evacuations, should give rise to strong suspicion of the presence of intestinal ulceration, especially if the patient be subject to attacks of looseness in the bowels. If, in addition, there be evidence of chronic lung disease, the frequency with which scrofulous ulcers of the alimentary canal complicate cases of pulmonary consumption must not be forgotten.

Prognosis.—The serious consequences usually associated with mesenteric disease are dependent, not upon the glandular enlargement, but upon the lesions by which it is apt to be accompanied. In an uncomplicated case, apart from the danger which is common to cheesy glands in general, there is no extraordinary cause of anxiety in caseous degeneration of the mesenteric glands. Indeed, on account of their slight tendency to undergo softening, disease in these glands is perhaps less likely to be followed by ill consequences than a similar affection of any other glands in the body. In rare cases, it is true, where the increase in size is unusually great, the exceptional dimensions of the tumour may form a special source of danger. In ordinary cases, however, it is not the mere presence of a cheesy lump in the mesentery which should excite our apprehensions. The glands are diseased as a consequence of irritation in parts around. We must search, therefore, for the source of this irritation, and the nature of the lesion which has produced it. It is to this we must look to determine the degree of gravity of the case.

If the enlargement in the mesenteric glands be the sole lesion discoverable, and the temperature of the child be natural, little anxiety need be excited; and so long as the nutrition of the patient remains good, there is every reason to hope that the swelling of the glands may subside. If, however, the presence of wasting with fever, indicates the existence of some complication, the prognosis becomes more serious. It is not uncommon for enlarged mesenteric glands to be dependent upon ulceration of the bowels, which may be itself secondary to chronic pulmonary disease. In these cases there is necessarily very great danger, and the progress of the case must be watched with serious apprehension; but the danger arises from the condition of the lungs and bowels, and can scarcely be said to be aggravated by the glandular enlargement. If signs of tuberculous peritonitis supervene with any intensity, little hope of a favourable issue can be entertained.

Treatment.—On account of the readiness with which the lymphatic glands, both internal and external, become enlarged in scrofulous children it is of great importance to remove as quickly as possible any local irritations, the continuance of which would lead to the glandular disease. All purulent discharges, skin eruptions, and ulcerations of the skin and mucous membrane must therefore receive prompt attention. "Little" colds must not be neglected, as disease of the bronchial glands is produced by pulmonary irritation; and the possibility of caseous enlargement of the glands of the mesentery is an additional reason for keeping a careful watch over the condition of the stomach and bowels.

In all cases where there is cheesy degeneration of glands, wherever these may be seated, prompt measures must be taken to improve the general health of the child. To effect this object the dietary should be constructed upon the principle which has already been so strongly insisted on in these pages, that, viz., of supplying a sufficient amount of nourishment to the body, without undue labour to the digestive organs. This is best done by depending largely upon meat, eggs, fish, and milk, and carefully avoiding excess of farinaceous or other fermentable articles, such as would be likely to cause acidity of the stomach and indigestion.

Change of air is of great importance. As soon as possible the child should be removed to some bracing spot, where the air is dry and the soil porous. An inland place is to be preferred to the seaside. Here the patient may pass his time out of doors whenever the weather permits; and at night, if the season be temperate, and the air not too damp, his window can be open at the top, so as to insure free ventilation of the sleeping-room. For full directions upon the important subject of diet and general hygiene the reader is referred to the chapter on chronic pulmonary phthisis.

Amongst the means for improving the general health, cold bathing must not be forgotten. Cold douches have been found of special service in the treatment of caseous lymphatic glands; and if proper precautions be taken, there is little danger of a chill, however apparently delicate the child may be. The best way of employing the cold bath is the following:—On rising from bed the patient is well and firmly shampooed over the whole body, and especially along the spine. The object of this process is to stimulate the skin and encourage a proper reaction. The child is then made to sit with his feet and lower part of his body in hot water (so as to diminish the shock) while a pitcher of water of the temperature of 65° Fahr., made more stimulating by the addition of a packet of "Brill's sea salt," is emptied over his shoulders. He is then well dried; his body is thoroughly rubbed with flesh gloves, and he is wrapped in a blanket and returned for half an hour to his bed. Although the bath is taken before breakfast it is desirable that the child be not fasting. All children, especially weakly ones, should have a slice of bread or a dry biscuit, and, if possible, a drink of milk, on waking in the morning.

With regard to special treatment:—If the gland be external, and there be no signs of softening or suppuration, the liniment of iodine may be painted on the swelling every night: or the oleate of mercury ointment may be made use of. This latter application should be rather weak (five per cent.), and should be smeared on the part, not rubbed in. It can be used twice a day for five days, then at night only, and afterwards every other day. Iodine ointment is sometimes very successful in removing caseous glands, but the application should be employed with caution, as it may produce sloughing. External treatment must be supplemented by the internal administration of cod's liver oil, given in small quantities at first, directly after meals. If the patient be anæmic, the dose of oil can be added to a draught containing perchloride of iron with infusion of calumba.

When softening has begun in an external caseous gland the contents should be evacuated as quickly as possible. The suppurating process must be encouraged by hot poultices, frequently changed; and when the abscess points, it is best to let out its purulent contents by a touch of the lancet. In cases where the abscess thus formed is slow to heal, and continues to discharge a thin purulent fluid, or continually re-inflames, the best treatment is the nightly administration of a powder containing one grain of hydrargyrum cum cretâ to eight grains of peroxide of iron. This dose may be given to a child of four years old. After taking the powders for a week or ten days there is usually a surprising improvement in the condition of the patient. The sulphide of calcium, in doses of one-sixth of a grain every two hours, is also sometimes of service, but more often it is unsuccessful. In cases where it succeeds, it succeeds very quickly. The chloride of calcium is also recommended. It may be given to a child of four years old in a dose of five grains three times a day.

When the *bronchial* glands are found to be enlarged every care should be taken to protect the patient against pulmonary catarrhs and other forms of chest-irritation, so as to avoid any aggravation of the already existing evil. The chest should be carefully protected by thick flannel worn next to the skin. Children of both sexes should be provided with a closely-fitting flannel under-garment, made to reach up to the neck. Thus guarded, the patient can pass a large portion of the day out of doors; and the drier the air and more porous the soil of the spot in which he is living the better for his chances of improvement. The diet must be regulated with care, as already directed, and the cold bath, used with all needful precautions, must not be forgotten. Cod's liver oil is of great service in these cases, and the popular remedy—iodide of iron—has no doubt a certain value. This is best given made into a draught by combining iodide of potassium with tartrate of iron in distilled water, the syrup of the iodide, which is the more favourite form for its administration, being apt to ferment in the stomach and cause acidity. Instead of an iodide, iodine itself may be given, and the internal administration of tincture of iodine in small doses (two or three drops freely diluted) is preferred by some practitioners. Blisters, so often recommended in these cases, appear to be attended by but little benefit. The local application of iodine, on the contrary, is often very useful, and frictions with iodine ointment over the upper part of the chest, or painting with the liniment in the same situation, should never be omitted, especially when the glands are of considerable size.

In the severe asthmatic attacks little is to be done by antispasmodics, and the harassing cough is not to be controlled by narcotics. Energetic counter-irritation with iodine preparations has, however, sometimes seemed to be of service.

When the glands of the *mesentery* are diseased our first care should be to remove any existing irritation of the intestinal canal. Where there is diarrhœa, the motions should be inspected, and if the stools are found to consist of putrid-smelling dirty water, with a thick sediment containing shreddy matter mixed up with small black clots of blood, there is little doubt that the bowels are ulcerated. In these cases suitable treatment must be adopted, as recommended in the chapter on chronic diarrhœa. Small enemata of thin warm starch containing a few drops of laudanum are very useful. If tubercular peritonitis occur, hot linseed-meal poultices applied to the belly, and opium given cautiously by the mouth, form the best remedies.

In cases where the glandular enlargement is uncomplicated, fresh air, good diet, and cod's liver oil, as before directed, will do all that is necessary. In these cases a broad flannel bandage applied tightly to the belly, and worn well down over the hips, is an indispensable part of the treatment.

CHAPTER XI.

DIET OF CHILDREN IN HEALTH AND DISEASE.

DIET IN HEALTH.—From birth to six months old—From six to twelve months—From twelve to eighteen months—From eighteen months to two years—After two years.

DIET IN DISEASE.—In simple atrophy—In chronic diarrhœa—In chronic vomiting—In rickets—In mucous disease—In pulmonary phthisis.

ON account of the importance of the subject of diet in relation to children, both in health and disease, the maintenance of their health, and the treatment of their several disorders being mainly dependent upon a proper regulation of their food, it has been thought advisable to devote a chapter especially to this subject.

Directions upon this matter, to be of any service at all, must be plain, minute, and exhaustive. Nothing should be left to the discretion of the attendants. The articles of food, the quantity to be given, the hours at which the meals are to be taken, and, when necessary, the exact method in which the food is to be prepared, should be all accurately stated and written down, or mistakes will almost certainly be committed.

In the following pages will be found dietaries, carefully arranged and tabulated, suitable to infants and children of various ages, both in health and disease. It should be stated, however, that the *quantities* given below are not intended to be invariable. It would be impossible to lay down rules which would be found suitable to all children.

Some require and can digest much more than others; the quantities, therefore, must be adapted in each particular case to the requirements and capabilities of the child. The amounts of farinaceous food ordered can, however, seldom be exceeded with safety.

DIET IN HEALTH.

1. FROM BIRTH TO SIX MONTHS OLD.

DIET 1.

If the child be suckled, and the breast-milk be found in all respects suitable:—

No other food should be given.

The child should take the breast every two hours for the first six weeks; afterwards, every three hours, except between 11 P.M. and 5 or 6 A.M.

In cases where the secretion of milk is slow to be established, and the quantity drawn is insufficient to supply the wants of the infant, the following food may be given as an addition to the breast-milk, until the secretion becomes sufficiently abundant:—

One tablespoonful of fresh cream.
Two tablespoonfuls of whey.*
Two tablespoonfuls of hot water.

This mixture must be taken from a feeding-bottle.

Or, we may make use of condensed milk, especially Loeflund's "Kindermilch," for a month or two, in the proportion of one teaspoonful to six ounces of water. Condensed milk should not, however, be depended upon as the sole food of the infant after the end of the third month.

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* Fresh whey is supplied in London to order by the Aylesbury Milk Company; but it is better to make the whey at home by means of "Benger's curdling fluid," which makes a beautiful whey very quickly. Full directions are given on the bottles.

DIET 2.

If the infant be brought up by hand:—

New cow's milk* and lime-water, in equal proportions. Three to four ounces, sweetened with a teaspoonful of sugar of milk, are to be given at first every two hours from a feeding-bottle.

The proportions of milk and lime-water must be varied according to the age of the infant.

From six weeks to three months one-third of lime-water may be used; and from three to five months this quantity can be reduced to one-fourth.

In some infants digestion is easier when a proportion of some thickening material is added to the milk. Thus, we may order—

Milk, one-third part.
Barley-water, one-third part.
Lime-water, one-third part.

This mixture may be sweetened with half a teaspoonful of extract of malt.

In the case of most hand-fed children it is found useful to introduce a certain variety into their diet, for by this means digestion appears to be encouraged. Therefore the following meals may be given in regular rotation with the preceding. It sometimes happens, indeed, that the infant can only be efficiently nourished on the condition that no two meals in the same day be composed of exactly the same materials.

Milk and water with gelatine (see page 40).

Mellin's food, one teaspoonful.
Milk, two parts.
Barley-water, one part.

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* It may not be out of place to remark that the popular belief in the greater excellence as a nursery food of "milk from one cow" is a pure superstition, and rests upon no solid foundation in fact.

Pancreatised milk (see page 46).

Benger's food.
Milk }
Water } equal parts.

Diet 3.

If the infant be partially suckled, the breast-milk being poor and scanty :—

The breast must be given only twice a day.

For the other meals the child must be fed as directed in *Diet* 2.

Up to the age of six months the milk should be warmed by placing the bottle containing it in a basin of hot water. After the age of six months it may be boiled, if convenient. New unskimmed milk should always be used. If the milk has been previously skimmed a teaspoonful of cream must be added to each meal.

In all cases where the child is artificially fed the utmost attention should be paid to the cleanliness of the feeding-bottle.

2. FROM SIX TO TWELVE MONTHS OLD.

Five meals in the day.

Diet 4.

First meal, 7 A.M.

One teaspoonful of baked flour carefully prepared, with a teacupful of milk, and sweetened with a small teaspoonful of extract of malt. (See page 49.)

Second meal, 10.30 A.M.; and

Third meal, 2 P.M.

A dessert spoonful of Mellin's food, in a breakfast-cupful of milk thickened with a teaspoonful of gelatine.

Fourth meal, 5.30 P.M.
Same as the first.

Fifth meal, 11 P.M.
Same as the third.

For the second meal, twice a week, may be given the yolk of one egg, beaten up with a teacupful of milk.

The method of preparing baked flour is given on page 49. Chapman's "Entire Wheaten Flour" should always be used. It is much to be preferred for children to the ordinary wheaten flour, containing as it does the phosphates of the wheat, and the cerealin, a peculiar body which changes starchy matters into dextrine. If there be constipation, a teaspoonful of fine oatmeal can be used instead.

Sometimes, in the case of infants of nine or ten months old, Mellin's food with milk alone does not seem sufficiently satisfying. In these cases it is advisable to add to the meal a teaspoonful of baked flour. The flour is first rubbed up with the milk, as directed on page 49, and the Mellin's food is added afterwards.

DIET 5.

For a child about ten months old.

First meal, 7 A.M.
A dessert-spoonful of Mellin's food;
A teaspoonful of Chapman's flour (baked);
A breakfast-cupful of new milk.

Second meal, 10.30 A.M.
A tablespoonful of pearl barley jelly* dissolved in a breakfast-cupful of warm milk, and sweetened with white sugar.

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* Put two tablespoonfuls of washed pearl barley into a saucepan, with a pint and a half of water, and boil slowly down to a pint. Strain away the barley and allow the liquid to set into a jelly.

Third meal, 2 P.M.

The yolk of one egg beaten up in a teacupful of milk, and sweetened with white sugar.

Fourth meal, 5.30 P.M.

Same as the second.

Fifth meal, 11 P.M.

Same as the first.

DIET 6.

To alternate with the preceding.

First meal, 7 A.M.

Half a teaspoonful of cocoatina,* boiled for one minute in a breakfast-cupful of milk.

Second meal, 10.30 A.M.

A breakfast-cupful of milk alkalinized, if necessary, by fifteen drops of the saccharated solution of lime, and thickened with a teaspoonful of isinglass or gelatine, and sweetened.

Third meal, 2 P.M.

A teacupful of beef-tea† (half a pound of meat to the pint).

A rusk.

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* In cocoatina a considerable portion of the fatty matter is removed. It is, therefore, more digestible than the ordinary cocoas, and far better adapted for an infant's diet. A dessert-spoonful of Mellin's food may be added to this meal if thought desirable.

† Beef-tea is to be made in the following way :—Put half a pound (or a pound, according to the strength required) of rump steak, cut up into small pieces, into a covered copper saucepan, with one pint of cold water. Let this stand by the side of the fire for four or five hours, and let it then simmer gently for two hours. Skim well and serve. The meat used should be as fresh as possible—the fresher the better—and should be cleared beforehand of all fat or gristle. If this precaution be neglected, a greasy taste is given to the beef-tea, which cannot be afterwards removed by skimming. The saucepan used should be made of copper or tin. Iron saucepans should not be used

Fourth meal, 5.30 P.M.

A tablespoonful of pearl-barley jelly, dissolved in a breakfast-cupful of milk, and sweetened.

Fifth meal, 11 P.M.

Same as the second.

It is advisable, as a rule, to avoid giving intermediate meals, and therefore the meals should be made sufficiently large to satisfy all reasonable demands.

If the child requires food before 7 A.M., on waking from sleep, a little milk may be given him.

A healthy child, between ten and twelve months old, will require a pint and a half of milk in the twenty-four hours.

3. FROM TWELVE TO EIGHTEEN MONTHS.

DIET 7.

First meal, 7.30 A.M.

A rusk, or a slice of stale bread, well soaked in a breakfast-cupful of new milk.

Second meal, 11 A.M.

A drink of milk; a plain biscuit or slice of thin bread-and-butter.

Third meal, 1.30 P.M.

A teacupful of good beef-tea (a pound of meat to the pint) or of beef-gravy, with rusk;

A good tablespoonful of light farinaceous pudding.

Fourth meal, 5.30 P.M.

Same as the first.

Fifth meal, 11 P.M. (if required).

A drink of milk.

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unless enamelled. In re-warming beef-tea which has been left to cool, care must be taken to warm the tea up to the point at which it is to be served, and no higher. It should on no account be allowed to boil.

DIET 8.

(To alternate with the preceding.)

First meal, 7.30 A.M.
The yolk of a lightly-boiled egg;
A slice of thin bread-and-butter;
A cupful of new milk.

Second meal, 11 A.M.
A drink of milk;
A slice of thin bread-and-butter.

Third meal, 1.30 P.M.
A mealy potato, well mashed with a spoon, moistened with two tablespoonfuls of good beef-gravy;
A cupful of new milk.

Fourth meal, 5.30 P.M.
A rusk or slice of stale bread, well soaked in a breakfast-cupful of milk.

Fifth meal, 11 P.M. (if required).
A drink of milk.

The fifth meal, at 11 P.M., should never be given unnecessarily. The sooner a child becomes accustomed to sleep all night without food the better. When, however, he wakes in the morning, refreshed by his night's rest, he should never be allowed to remain fasting for an hour or more until his breakfast is prepared. A drink of milk or a thin slice of bread-and-butter should be given at once.

Some children will take larger quantities than others at one meal; but if the meals are made very large their number must be reduced in proportion. Many children between twelve and eighteen months old will be found to do well upon only three meals a day, as in the following:—

DIET 9.

First meal, 8 A.M.

One teaspoonful of baked flour;
One teaspoonful of fine oatmeal;
Three-quarters of a pint to a pint of fresh milk;
A little white sugar.

Second meal, 1 P.M.

The same, with the addition of the yolk of one egg.

Third meal, 5 P.M.

Same as the first.

In this diet the baked flour and the oatmeal are first beaten up till smooth, with four tablespoonfuls of cold water, and are then boiled. The milk and sugar are then added, and the mixture is boiled till it thickens.

For the second meal the yolk of egg is stirred up in the saucepan and boiled with the rest.

If the child requires anything early in the morning, or at 11 P.M., he may take a drink of milk, or a thin slice of bread-and-butter.

A healthy child of a year to eighteen months old will usually take from a pint and a half to two pints of milk in the four-and-twenty hours.

DIET 10.

4. FROM EIGHTEEN MONTHS TO TWO YEARS OLD.

First meal, 7.30 A.M.

A breakfast-cupful of new milk;
A rusk or thin slice of bread-and-butter.

Second meal, 11 A.M.

A cup of milk.

Third meal, 1.30 P.M.
Underdone roast mutton, pounded in a warm mortar, a good tablespoonful;
One well-mashed potato moistened with two or three tablespoonfuls of gravy;
For drink, filtered water or toast-water.

Fourth meal, 5.30 P.M.
A breakfast-cupful of milk;
A thin slice of bread-and-butter.

After the age of eighteen months it is well to omit the meal at 11 P.M. A healthy child of eighteen months old should sleep from 6 P.M. to 6 A.M. without waking.

DIET 11.

(For a child of the same age.)

First meal, 7.30 A.M.
A breakfast-cupful of new milk;
The lightly-boiled yolk of one egg;
A thin slice of bread-and-butter.

Second meal, 11 A.M.
A cup of milk.

Third meal, 1.30 P.M.
A breakfast-cupful of beef-tea (a pound of meat to the pint), containing a few well-boiled asparagus-heads, when in season, or a little thoroughly stewed flower of broccoli;
A good tablespoonful of plain custard-pudding.

Fourth meal, 5.30 P.M.
A breakfast-cupful of milk;
Bread-and-butter.

These diets can be given on alternate days.

Between the ages of two and three years the same diets may be continued. Meat can, however, be given every day, and a little well-stewed fruit may be occasionally added.

The morning and evening meals should always consist principally of milk.

DIET IN DISEASE.

DIET IN INFANTILE ATROPHY.

(For a child of two or three months old, brought up by hand, weakly and emaciated, in whom milk with lime-water excites griping and flatulence, with occasional attacks of vomiting and purging.)

In these cases special attention must be paid to the cleanliness of the feeding-bottle. It is important, also, that meals consisting of milk or other fermentable matter be prepared in small quantities as they are wanted—to avoid fermentation.

We can often succeed in rendering the milk and lime-water digestible by adding an aromatic—such as a teaspoonful of cinnamon-water—to the food.

If this do not succeed, one of the following diets can be tried:—

DIET 12.

The child to be fed every three hours from a feeding-bottle with the following, in alternate meals:—

1. One teaspoonful of Mellin's food for infants dissolved in a teacupful of new milk and barley-water (equal parts), with the addition of one teaspoonful of cinnamon or dill-water.
2. Two teaspoonfuls of Mellin's food dissolved in a teacupful of fresh whey.

If the amount of milk given above cannot be digested, as often happens, the proportion of barley-water used to dilute the milk may be increased to two-thirds: or in some of the meals the milk may be altogether omitted. Instead, we may use barley-water, whey, or equal proportions of barley-water and weak veal or chicken-broth, in which the Mellin's food can be dissolved.

In the place of ordinary milk we may use "strippings" (see page 45), or ass's or goat's milk.

In the above diets the quantities given at each time of feeding must be proportioned rather to the *strength* of the child than to his *age*. The more weakly the infant, the smaller and more frequent should be the meals.

In cases where the weakness and emaciation are great, the child, for a few days, should be fed solely upon white wine whey. Afterwards, when the strength has begun to return, the wine whey may be given in alternate meals with peptonised milk.

DIET 13.

White wine whey (see page 114).
Pancreatized milk (see page 46).

These foods to be given alternately in such quantities as the infant is found to digest without difficulty. It is best to begin with a tablespoonful every half-hour; but this quantity will soon have to be increased. As the meals get larger the intervals between them must be lengthened.

DIET IN CHRONIC DIARRHŒA.

(For a child ten or twelve months old, who can bear milk: purging not very severe.)

DIET 14.

A teaspoonful of Mellin's food for infants every three hours, dissolved alternately in milk and barley-water (equal parts), and in equal parts of weak veal broth and barley-water.

If no milk at all can be digested, a good diet is the following :—

DIET 15.

First meal, 7 A.M.

One teaspoonful of Mellin's food for infants, dissolved in a teacupful of veal broth and barley-water (equal parts).

Second meal, 11 A.M.

One dessert-spoonful of cream in a teacupful of fresh whey.

Third meal, 2 P.M.

The unboiled yolk of one egg beaten up with fifteen drops of brandy ; a tablespoonful of cinnamon-water ; and a little white sugar.

Fourth meal, 5 P.M.

Four ounces of veal-broth (a pound to the pint).

Fifth meal, 11 P.M.

Same as the first.

After a week or ten days a little milk can be introduced into the diet, beginning cautiously, and only once in the day. Thus, for the first meal, milk may be substituted for the veal broth, and be added to the barley-water and Mellin's food. If this be found to agree, the same change may be made in the fifth meal.

Another, consisting partially of milk, for a child of twelve months old :—

DIET 16.

First meal, 7 A.M.

One teaspoonful of cocoatina boiled for one minute with a teacupful of milk.

Second meal, 10 A.M.

A teacupful of veal-broth (a pound to the pint).

Third meal, 2 P.M.
A teacupful of milk alkalinized with fifteen drops of saccharated solution of lime.

Fourth meal, 5 or 6 P.M.
The yolk of one egg beaten up with brandy and cinnamon-water, as in *Diet* 15; or beaten up with a teacupful of veal broth and barley-water (equal parts).

Fifth meal, 11 P.M.
One teaspoonful of Mellin's food for infants dissolved in a teacupful of warm milk.

If the child be much reduced by the purging the diet should be simpler in character, and the meals should be smaller, more frequently repeated, as in the following:—

DIET 17.

(For a weakly child of twelve months old.)

First meal, 7 A.M.
Four ounces of whey, with a teaspoonful of cream.

Second meal, 9.30 A.M.
Four ounces of veal broth (half a pound to the pint).

Third meal, NOON.
A tablespoonful of pearl-barley jelly, dissolved in four ounces of whey.

Fourth meal, 2.30 P.M.
Four ounces of milk and lime-water (equal parts), with a teaspoonful of cinnamon-water.

Fifth meal, 5 P.M.
One teaspoonful of Mellin's food for infants dissolved in four ounces of barley-water.

Sixth meal, 9 P.M.

Same as the second.

During the night whey or barley-water may be given.

If the purging be very severe, all regular meals must be discontinued. Any of the above varieties of liquid food may be selected; and of this the child can take one tablespoonful every half-hour. Milk, however, is seldom found to agree: but *Diet* 13 may be tried.

DIET IN CHRONIC VOMITING.

In this disorder the food must be given in minute quantities, one teaspoonful in many cases being all that can be retained at one time. This may be repeated every twenty minutes. In bad cases milk must be strictly forbidden.

Choice may be made from the following :—

- Diluted whey with cream, as in *Diet* 1.
- Veal broth, and barley-water (equal parts).
- One teaspoonful of Mellin's food for infants dissolved in four ounces of whey and barley-water (equal parts), or in equal parts of weak veal broth and barley-water.
- White wine whey (see page 114).

Whatever the food may be, it should be given cold, not lukewarm.

If the vomiting be only occasional and not severe, *Diet* 17 may be tried, suiting the quantities to be given at one time to the degree of irritability of the stomach. Pancreatized milk sometimes is well borne in these cases. If the infant be much exhausted, it is best to trust solely to white wine whey given cold, and in small quantities, at regular intervals.

DIET IN RICKETS.

Here the kind of diet will depend in a great measure upon the condition of the alimentary canal. In almost all cases it will be found that farinaceous food has been supplied in excessive quantities, and the amount will have to be considerably reduced. If the bowels are relaxed, with loose, slimy, offensive motions, *Diets* 15 and 16 will be suitable. If the motions are healthy, *Diets* 5, 6, 7, 8, 10, 11, may be made use of, according to the age of the child.

If the child be sixteen or eighteen months old the following is of service:—

DIET 18.

First meal, 7.30 A.M.

One or two teaspoonfuls of Mellin's food for infants, dissolved in a breakfast-cupful of milk.

Second meal, 11 A.M.

A breakfast-cupful of milk alkalinized by fifteen drops of the saccharated solution of lime.

Third meal, 2 P.M.

A good tablespoonful of well-pounded mutton-chop with gravy, and a little crumbled stale bread;
Or a good tablespoonful of the flower of broccoli well stewed with gravy until quite tender;
Thin bread-and-butter;
For drink toast-water.

Fourth meal, 6 P.M.

Same as the first;
Or (if no meat has been given) the lightly-boiled yolk of one egg;
Thin bread-and-butter;
Milk and water.

DIET IN MUCOUS DISEASE.

(Farinaceous food is as much as possible to be avoided.)

Diet 19.

(For a child about seven years of age and upwards.)

Breakfast, 8 A.M.
Three-quarters of a pint of fresh milk alkalinized by twenty drops of the saccharated solution of lime;
A thin slice of well-toasted bread;
Fresh butter;
A fresh egg lightly-boiled or poached.

Dinner, NOON.
A mutton-chop without fat, broiled;
Well-boiled cauliflower or French beans, according to season;
A thin slice of well-toasted bread;
Half a wineglassful to a wineglassful of sound sherry, diluted with twice its bulk of water.

Tea, 4 P.M.
Same as breakfast.

Supper, 7 P.M.
A breakfast-cupful of beef-tea (a pound to the pint);
A thin slice of dry toast.

Diet 20.

(For the same.)

Breakfast, 8 A.M.
Half a pint of new milk alkalinized with fifteen drops of the saccharated solution of lime;
A slice of cold roast beef or mutton;
A thin slice of well-toasted bread.

Dinner, NOON.

A little boiled sole or turbot (without melted butter);

A thin slice of stale bread;

Chocolate blanc-mange (made with gelatine, not cornflour);

A large wineglassful of claret, diluted with an equal bulk of water.

Tea, 4 P.M.

A poached egg on a thin slice of dry toast;

Milk and water.

Supper, 7 P.M.

Three-quarters of a pint of alkalinized new milk.

DIET 21.

(For the same.)

Breakfast, 8 A.M.

One teaspoonful of Cadbury's cocoa essence boiled for one minute in half a pint of milk;

A slice of thin dry toast;

A thin rasher of fat bacon, crisply broiled.

Dinner, NOON.

The wing of a roasted or boiled fowl;

A little well-boiled flower of cauliflower or well-stewed celery;

A slice of thin dry toast or stale bread;

Baked custard-pudding;

A large wineglassful of claret, diluted with an equal quantity of water.

Tea, 4 P.M.

Half a pint of alkalinized milk;

A lightly-boiled egg;

A thin slice of dry toast.

DIET 22.

(*For a child of seven years and upwards.*)

Breakfast, 8 A.M.
Half a pint of new milk alkalinized with fifteen drops of the saccharated solution of lime;
A lightly-boiled egg;
Thin bread-and-butter.

Dinner, 12 or 1 P.M.
A slice of roast beef or mutton with gravy;
A mealy potato well mashed;
Custard or batter pudding;
For drink, half a wineglassful of dry sherry, diluted with twice its bulk of water.

Tea, 4 or 5 P.M.
A teaspoonful of chocolate or cocoa boiled with half a pint of milk;
Thin bread-and-butter or a rusk.

Supper, 7 or 8 P.M.
Half a dozen raw oysters;
Bread-and-butter.

The ordinary cocoa is to be preferred for the third meal, if it can be digested. If it seem too heavy, cocoatina may be used instead.

DIET 23.

(*For a child of the same age.*)

Breakfast, 8 A.M.
Alkalinized new milk, as much as desired;
A rusk, or bread-and-butter.

Dinner, 12 or 1 P.M.
A slice of boiled leg of mutton;
A well-boiled carrot or turnip;
A spoonful of savoury omelet;
For drink, dry sherry and water, as before.

Tea, 4 or 5 P.M.
Bread and milk.

Supper, 7 or 8 P.M.
A small basin of tapioca soup or of clear turtle soup.

DIET 24.

(*For the same age.*)

Breakfast, 8 A.M.
Bread and milk.

Dinner, 12 or 1 P.M.
Roast or boiled fowl;
A mealy potato;
Chocolate blanc-mange (made with gelatine);
Sherry and water.
For dessert, a good bunch of sweet grapes.

Tea, 4 or 5 P.M.
A lightly-boiled egg;
Thin bread-and-butter;
Half a pint of milk;
Or, the egg may be beaten up raw with the milk.

Supper, 7 or 8 P.M.
A basin of strong beef-tea.

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